EFFECTIVENESS OF KINESIOTAPING AND ACU-TENS ON MATERNAL AND NEONATAL OUTCOMES IN THE FIRST STAGE OF LABOR AMONG PRIMIGRAVIDAS

A COMPARATIVE STUDY

Dissertation submitted to

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In partial fulfillment of the requirements for the degree of

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COLLEGE OF PHYSIOTHERAPY

SRI RAMAKRISHNA INSTITUTE OF PARAMEDICAL SCIENCES
COIMBATORE – 641044

CERTIFICATE

This is to certify that the dissertation work entitled **"Effectiveness of Kinesiotaping and Acu-TENS on maternal and neonatal outcomes in the first stage of labor among primigravidas - A Comparative Study"** was carried out by the candidate bearing the **Register No. 271760002 (MAY 2019)** in College of Physiotherapy, SRIPMS, Coimbatore, affiliated to the Tamil Nadu Dr. M.G.R Medical University, Chennai towards partial fulfillment of the **Master of Physiotherapy (Obstetrics and Gynaecology).**

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Date:

CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

Place:

Date:

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LIST OF ABBREVATIONS

CS	-	Caesarean Section
WHO	-	World Health Organization
FIGO	-	International Federation of Gynaecology
HELLP	-	Haemolysis, Elevated Liver enzymes, Low Platelet count
TENS	-	Transcutaneous Electrical Nerve Stimulation
ACU-TENS	-	Acupuncture like TENS
KT	-	Kinesiotaping
AARI	-	Average Annual Rate of Increase
VAS	-	Visual Analogue Scale
LBP	-	Low Back Pain
CDMR	-	Caesarean Delivery on Mother's Request
APGAR `	-	Appearance, Pulse, Grimace, Activity, Respiration
PPH	-	Post-Partum Haemorrhage

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Abstract

ABSTRACT

Background:

The rate of caesarean section according to National Family Health Survey-4 in Tamilnadu was increased from 8.5% to 17.2% over the last decade. The most common reason for rise in elective caesarean section rate among primigravidas was maternal request due to fear of labor pain. The important factors causing labor pain are dilatation of cervix and uterine contractions. Non-pharmacological methods such as kinesiotaping, Acu-TENS and breathing exercises are safe and effective for maternal pain relief during the first stage of labor.

Objective:

This study was conducted to evaluate the effects of kinesiotaping and Acu-TENS combined with breathing exercises on maternal and neonatal outcomes among primigravid women.

Participants and methods:

This study was conducted on 40 normal full-term primigravid women during the first stage of labor with regular painful, palpable uterine contractions and cervical dilatation from 3cm to 5cm. They were assigned into 2 equal groups, group A and group B. Group A received kinesiotaping with breathing exercises while group B received Acu-TENS with breathing exercises. Assessment of pain during first stage of labor for all participants was carried out before and after the treatment program using visual analogue scale (VAS). Other measures such as duration of active phase in first stage labor, mode of delivery and neonatal well-being were measured after treatment following delivery.

Results:

Kinesiotaping group experienced VAS score reduction (5.800) significantly more than the ACU-TENS with breathing exercises group (7.350), the 'p' value obtained is 0.004 which is < 0.05. But there is no significant change in duration of the active phase of first stage labor between group A (317.25) and group B (257.00), the 'p' value obtained is 0.319 which is > 0.05. Therefore the null hypothesis is accepted. Caesarean section rate was increased in group A (35% [7/20]) than in group B (25% [5/20]), but neonatal outcomes were not different.

Conclusion:

This quasi-experimental study showed that kinesiotaping with breathing exercises (Group A) resulted in significantly better pain relief than ACU-TENS with breathing exercises (Group B) in the first stage of labor among primigravidas. But there is no significant difference between the two intervention groups in terms of duration of active phase of first stage labor, Apgar score at 1 minute and 5 minutes post-delivery. Caesarean section rate was slightly increased in group A compared to group B. No obvious adverse effects in maternal and neonatal outcomes were noted between the groups. Kinesiotaping and ACU-TENS combined with breathing exercises could be a non-invasive adjunct for pain relief in the first stage of labor for primigravidas.

Keywords: Labor pain, caesarean section, primigravid, kinesiotaping, Acu-TENS.

Introduction

CHAPTER 1

INTRODUCTION

1.1 TOPIC OVERVIEW

Labor is defined as the physiological process in which the products of conception such as the fetus, membranes, umbilical cord and placenta are expelled from the uterus via the birth canal after a minimum period of 20 weeks [1, 2].

During labor the uterus, a hollow muscular structure, has the ability to contract and relax, progressively causing the descent of the fetus, the effacing and dilation of cervix and finally the passive movement of the fetus through the birth canal. Throughout the procedure, the contractions increase in intensity, duration and frequency. Cervical dilation and effacement may also be present before labor. It is accepted clinically that labor has started (onset of labor) when the cervical dilatation progresses beyond 2cm [1].

Stages of labor: [1]

- Stage 1: From the onset of labor until full dilation of cervix.
- Stage 2: From full cervical dilation to the expulsion of the fetus from the vagina.
- Stage 3: The expulsion of the placenta and membranes.

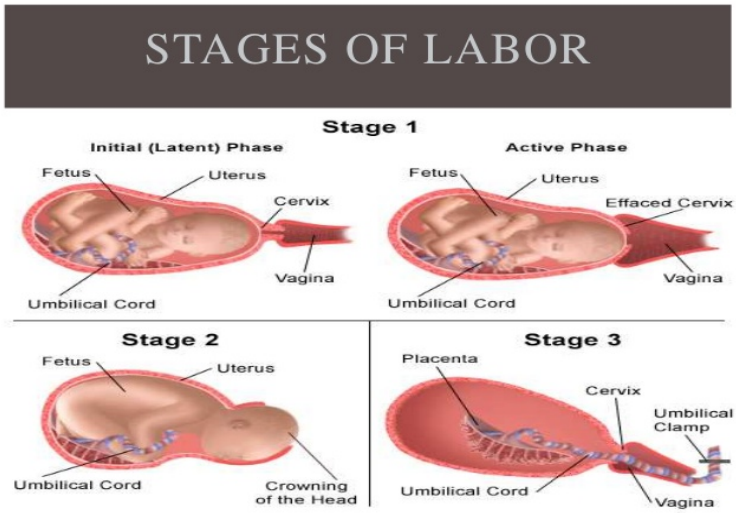


Fig. 1 Stages of labor

Pain characteristics during labor: [1]

a) First stage of labor:

- Primarily due to:
  - The dilation of cervix,
  - Contraction and distension of uterine muscle,
  - Pressure of the uterus on the surrounding sensitive structures,
  - Contraction pain increases in intensity as the intrauterine pressure increases and the cervix dilates and stretches.

- Pain pathways: Nerves from the uterus and cervix enter, primary to T_{11} and T_{12}, secondary to T_{10} and L_1.

- Distribution of pain: Diffused over a larger area, lower abdomen and small of back. Later, more intensive, including thigh and perineal area.

b) Second stage of labor:

- Primarily due to
    - The dilation, stretching and distension of the outlet and perineum,
    - Pain increase in severity as the fascia, skin, subcutaneous tissue and other somatic structures which are pain sensitive are stretched and torn,
    - Pressure and stretching of bladder, urethra, rectum with pressure on one or more roots of lumbosacral plexus.

- Pain pathways: Nerves from the cervix and pelvic floor pass to sacral segments S_2, S_3, S_4.

- Distribution of pain:
    - Early: Intense pain in the lower abdomen.
    - Late: Intense localized perineal pain, uterine pain decreases.

c) Third stage of labor:

- The contractions are often less painful and less frequent as the uterus expels placenta from the uterine wall.

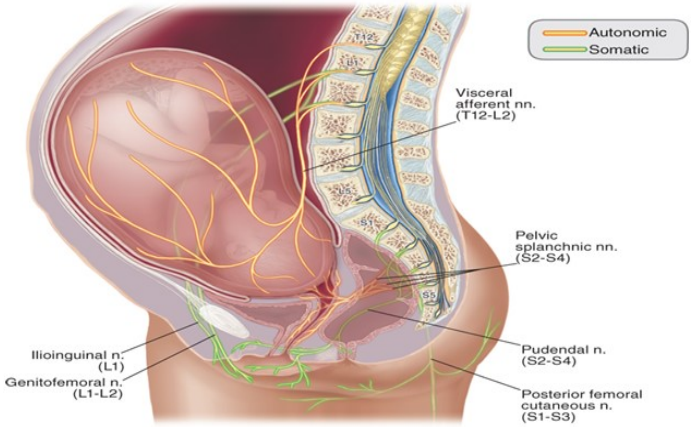


Fig. 2 Autonomic and Somatic pain pathways during labor

Cervical dilation occurs as the result of contracting and retracting upper segment lifting up and thinning out of the lower segment, ultimately pulling the cervix over the advancing presenting part, significantly altering the level of the external os in the pelvis. A well fitting presenting part favors good uterine action and smooth dilatation of the cervix. Cervical dilation and descent of the fetus are the best parameters to decide the progress of labor more than the uterine contraction [3].

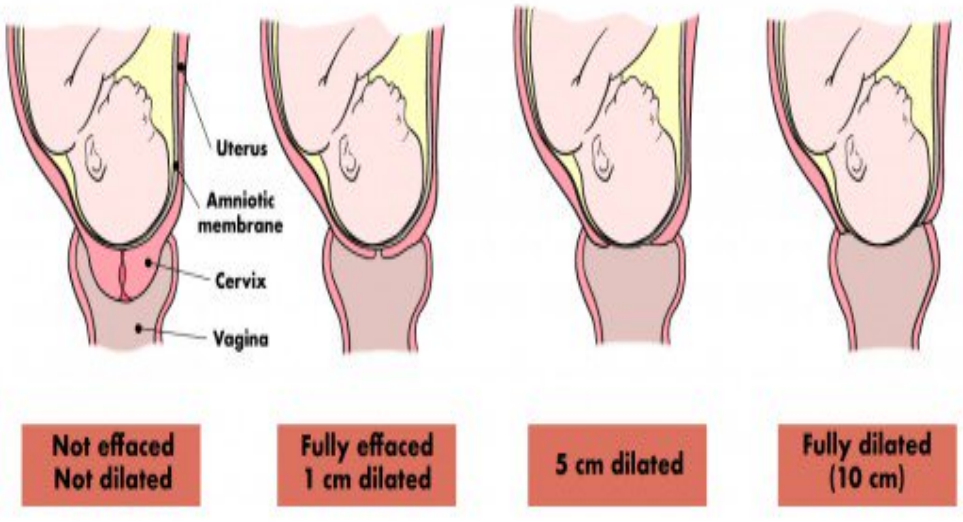


Fig. 3 Dilatation and Effacement of Cervix during labor

The duration of each stage is highly variable among women. The length of active phase, first stage was 7.7 hours for nulliparas and 5.6 hours for multiparas, while length of the second stage was 54 minutes for nulliparas and 18 minutes for multiparas among low-risk women [4].

Mode of delivery is one of the important and reliable parameter in the evaluation of maternal outcomes during labor. Different modes of delivery are normal vaginal delivery, instrumental delivery or assisted vaginal delivery and caesarean section (CS) [5].

World health organization stated that caesarean sections have become increasingly common in both developed and developing countries. CS is effective in saving maternal and infant lives, but only when they are required for medically indicated reasons. CS are associated with short and long term risk which can extend many years beyond the current delivery and affect the health of the woman, her child and future pregnancies [6].

National family health survey-4 (NFHS-4) revealed that in India, especially urban and private hospitals, CS rate were increased over the last decade and also there is increase in CS rate in Tamilnadu among urban areas than rural areas [7, 8].

Traditionally, it has been considered inappropriate for women to have an elective CS on request in an uncomplicated pregnancy. In accordance with the advice of the International Federation of Gynecology (FIGO), performing a CS for non-medical reasons are ethically unjustified [9].

Table – 1: Reasons for caesarean section [9, 10, 11, 12, 13]

Elective CS	Emergency CS
• Maternal request due to: ➢ Fear of painful natural childbirth ➢ To avoid prolonged labor ➢ Less pelvic floor trauma ➢ Better control of time of birth as dictated by horoscopes/astrological calculation ➢ To maintain the vaginal tone of teenagers ➢ Greater safety for baby (fetal well-being)	• Absolute indications: ➢ Absolute disproportion ➢ Chorioamnionitis ➢ Maternal pelvic deformity ➢ Eclampsia and HELLP syndrome ➢ Fetal asphyxia/fetal acidosis ➢ Umbilical cord prolapse ➢ Placenta previa ➢ Abnormal lie and presentation ➢ Uterine rupture • Relative indications: ➢ Pathological cardiotocography ➢ Secondary arrest

Table – 2: Complications of caesarean section [13-19]

Elective CS	Emergency CS	Common in both the type of CS
• Fetal acidemia • Myocardial ischemia • Risk of respiratory morbidity in term infants • 2.84 fold greater chance of maternal death	• High Maternal morbidity • High Maternal mortality	• Urinary and fecal incontinence • Sexual dysfunction • Niche in scar with postmenstrual spotting • Endometritis • Urinary tract infection • Wound infection • Reduction of future fertility • Increased risk for placental abruption and ectopic pregnancy in subsequent pregnancy

The national institute for clinical excellence has stated that effective ways of supporting pregnant women are need in making informed decisions during labor [20]. The management of labor pain is one of the main goals of maternity care [21]. Women experience the pain of labor differently, with many factors contributing to their overall perception of pain. Although many women hope that they will manage to cope with labor without restoring to analgesia, it is important for them to know about availability of various methods of pain relief measures [22].

Pharmacological methods of pain relief commonly administered during labor like oral medications, entanox, parenteral analgesics and epidural analgesia to the mother may result in some side-effects such as nausea, vomiting, light headedness, confusion, disorientation, postural hypotension, weakness of legs, difficulty in passing urine, shivering, delay in second stage, infection, neural damage, dural puncture, backache, other life threatening complications and also these methods do have effect on the new born [1, 22].

Non-pharmacological methods of pain relief during labor are relaxation techniques, massage, breathing exercises, music, aromatherapy, partner support, warm baths, hypnosis, acupuncture, acupressure, TENS and kinesiotaping. These methods of pain relief can be effective for laboring woman by the concept of a pain "neuromatrix" in which the perception of pain is simultaneously modulated by multiple influences [1, 22, 23, 24].

The kinesiotaping method [KT] was developed by Kenzo kase over 30 years ago. The KT technique consists of an elastic and adhesive tape applied to specific places on the skin, depending on the disorder to be treated [25]. Since then, it has become the gold standard for therapeutic rehabilitative taping. As per few recent studies, KT was recently used for pain relief during the first stage of labor. The most appropriate application site of KT would be the dermatome of uterine innervations, which have visceral and somatic characteristics at levels T_{10}-L_1 and S_2-S_4, respectively and also over the anterior lower abdomen where radiating pain was felt [2, 25].

Acupuncture is an ancient system widely used in the treatment of pain for thousands of years in china. Acupuncture like TENS on acupuncture points (Acu-TENS) such as Li4 (Hegu) and Sp6 (Sanyinjiao) for pain relief during labor was designed to work, based on a combination of the central and peripheral actions to release much more endogenous opioid peptides or through "gate theory" mechanism [26, 27, 28].

Breathing awareness and patterned breathing such as diaphragmatic breathing and costal breathing enable a woman for better control of her response to labor. The purpose of breathing during labor is to allow the woman to identify normal breathing pattern, promote relaxation and concentration, serves as a signal to initiate breathing patterns at the beginning of a contraction and at the end of the contraction as labor progresses [29].

1.2 NEED FOR THE STUDY:

Caesarean section (CS) rates increased worldwide, from 6.7% in 1990 to 19.1% in 2014, which represents a 12.4% absolute increase and an average annual rate of increase (AARI) of 4.4%. Less developed countries showed the largest absolute increase, from 6.3% to 20.9% (AARI = 5.1%). More developed countries showed an absolute increase in the CS rate from 14.5% to 27.2% (AARI = 2.6%). The rate of CS in least developed countries only rose from 1.9% to 6.1% (AARI = 5%) [30].

The World Health Organization stated that at population level, CS rates higher than 10% are not associated with reductions in maternal and newborn mortality rates. Every effort should be made to provide Caesarean Sections to women in need, rather than striving to achieve a specific rate [6].

NFHS-4 revealed that the rate of CS in India was increased from 20.3% to 34.1%, while in Tamilnadu, the rate of CS was increased from 8.5% to 17.2% over the last decade (2006 -2016) [7, 8].

The most common reason for rise in Elective CS rate was maternal request due to fear of painful vaginal delivery especially among primigravidas [9-12, 17, 31].

Prompt action is needed to reduce the unacceptable high rate of elective caesarean deliveries by improving women's knowledge about the risks, benefits of different modes of delivery and also by offering safe and effective resources for pain and anxiety control during labor which can lead to a positive maternal attitude towards vaginal delivery [25].

Pharmacological and non-pharmacological methods of pain relief are complementary procedures which help a woman suffer less anxiety and pain during childbirth. Moreover, pharmacological methods of pain relief during labor were associated with various adverse effects on both the mother and the new born while non-pharmacological methods were used to modify the woman's response to pain and enhance her coping mechanism and also contribute to better maternal and neonatal outcomes without any adverse effects [1,22].

Since, only limited literature supports are available regarding the use of kinesiotaping and Acu-TENS, that are safe and effective for maternal pain relief during the first stage of labor,[23] this study was designed to find out the effects of kinesiotaping and Acu-TENS combined with breathing exercises on maternal and neonatal outcomes among primigravid women.

1.3 OBJECTIVES OF THE STUDY:

- To determine the effectiveness of kinesiotaping with breathing exercises on maternal and neonatal outcomes in the first stage of labor among primigravidas.

- To determine the effectiveness of Acu-TENS with breathing exercises on maternal and neonatal outcomes in the first stage of labor among primigravidas.

- To compare the effectiveness of kinesiotaping and Acu-TENS combined with breathing exercises on maternal and neonatal outcomes in the first stage of labor among primigravidas.

1.4 RESEARCH QUESTIONS:

- Is kinesiotaping combined with breathing exercises during the first stage of labor effective in bringing out changes on maternal and neonatal outcomes among primigravid women?

- Is Acu-TENS combined with breathing exercises during the first stage of labor effective in bringing out changes on maternal and neonatal outcomes among primigravid women?

- Whether kinesiotaping with breathing exercises or Acu-TENS combined with breathing exercises during the first stage of labor effective in bringing out changes on maternal and neonatal outcomes among primigravid women?

1.5 HYPOTHESIS:

1.5.1 NULL HYPOTHESIS:

- There is no significant effect on maternal and neonatal outcomes when kinesiotaping and Acu-TENS combined with breathing exercises are administered to primigravid women during first stage of labor.

1.5.2 ALTERNATE HYPOTHESIS:

- There is a significant effect on maternal and neonatal outcomes when kinesiotaping and Acu-TENS combined with breathing exercises are administered to primigravida women during first stage of labor.

Review of Literature

CHAPTER 2

REVIEW OF LITERATURE

1. **Maria Amelia Miquelutti, Jose G Cecatti (2017)** evaluated the systematic use of kinesiotaping during albor for pain control. They concluded no adverse effects to both the mother and neonate with kinesiotaping application. They assumed that pain relief with kinesiotaping would be similar to massage via skin mechanoreceptor stimulus.
2. **Kaur et al (2017)** found out that connective tissue mobilisation and kinesio-taping techniques are equally effective in treating the menstrual pain and pre-menstrual symptoms among 40 females. Kinesiotape was applied to group A one day prior to menstruation for 3days, while for group B, the connective tissue mobilisation was done one day prior to menstruation for 3 days.
3. **Jung-Hyun Choi (2017)** evaluated the effects of taping and hot packs on premenstrual syndrome. Data revealed that both the taping and taping with hot pack groups showed significantly reduced premenstrual syndrome following the intervention.
4. **Ana Pilar Betran et al (2016)** collected multinational-representative data on CS rates from 1990 to 2014 and calculated regional and subregional weighted averages and found that among 150 countries, currently 18.6% of all births occur by CS ranging from 6% to 27.2% in the least and most developed regions, respectively.

5. **Ghada E.EL-Refaye et al (2016)** conducted a study on 40 normal full term primigravid women. They were randomly assigned into 2 equal groups such as study group and control group. The study group received kinesiotaping with breathingexercises, while control group received breathing exercise with conventional treatment. This study suggested that kinesiotaping combined with breathing exercise is an effective method in reducing labor pain and shortening the duration of first stage of labor.
6. **Seyhmus Kaplan et al (2016)** investigated the short term effects of lumbar kinesiotaping on pain intensity and disability among 65 women with pregnancy-related low back pain. The results of this study indicated that kinesiotaping can be used as a complementary treatment method to achieve effective control of the pregnancy-related low back pain.
7. **Kate M Levett et al (2016)** did an open-label, assessor blind, randomised controlled trail among 176 nulliparous women with low risk pregencies in two public hospitals, Sydney, Australia. The proved that six evidence based complementary medicine techniques for labour and birth significantly reduced epidural use and Caesarean section.
8. **Forozeshfard M et al (2016)** investigated the efficacy of lumbar vertebral column kinesiotaping among 32 young females with menstrual LBP. This study revealed significant reduction in VAS, McGill pain score; functional diability by using KT during menstrual cycle.
9. **Mollart L et al (2016)** this is a two-arm randomised controlled trial aimed to determine the willingness of women experiencing a post-date pregnancy to participate in a randomised controlled trial of acupressure and compliance with the study protocol. This study revealed that pregnant women are interested in use of acupressure for initiation of labor.

10. **National Family Health Survey-4 (2015-16)** India fact sheet provides information on population, health and nutrition for India. $NFHS_4$ revealed that births delivered by caesarean section was 17.2% while $NFHS_3$ (2005-06) was 8.5%, there by concluding that caesarean section rates were increased in overall India in the recent years.
11. **National Family Health Survey-4 (2015-16)** State fact sheet-Tamilnadu provides information on population, health and nutrition for Tamilnadu state. This concluded that births delivered by caesarean section for $NFSH_4$ was 34.1% where as $NFHS_3$ (2005-06) was 20.3%, thereby found that caesarean section rates were increased in Tamilnadu state in the recent years.
12. **World Health Organization (2015)** concluded that caesarean sections have become increasingly common in both developed and developing countries which are associated with short and long term risk that affect the health of woman, her child and future pregnancies. However, avoiding medically unnecessary operations is a challenging task.
13. **Ioannis Mylonas, Klaus Friese (2015)** explained about the absolute and relative indications for elective caesarean section and also about urinary, fecal incontinence and sexual dysfunction after caesarean section.
14. **Mohammad Naeem et al (2015)** found top six indicators for caesarean sections to be foetal distress, obstructive labor/ failure to progress, previous caesarean section, breech presentation, cephalopelvic disproportion, failed induction and pregnancy induced hypertension among 210 caesarean section, out of 966 deliveries in a tertiary care Hospital of Peshawar.

15. **Mollart LJ et al (2015)** examined the effects of acupressure on labour onset and duration of labour among 748 women using different acupressure points and methods. The two most studied acupoints Sanjinjiao/Spleen 6 and Hegu/ Large intestine 4. Results suggested that acupressure may reduce the length of the labour particularly in the first stage.
16. **Ghotbi et al (2014)** found that among 600 deliveries, 501 (83.5%) were CS and 99 (16.5%) were normal vaginal delivery. The overall rate of caesarean delivery on mother's request (CDMR) was 20.8% and the most frequent reason was fear of pain. This study concluded that improving women's knowledge about the risks and benefits of different modes of delivery can lead to a positive maternal attitude towards vaginal delivery.
17. **Maimoona Hafeez et al (2014)** found that among 1149 pregnancies in a teaching hospital, 246 caesarean sections were performed in that 96 caesarean sections (38.6%) were performed electively while 151 caesarean sections (61.35%) were performed on emergency basis. The rising prevalence of caesarean section was mainly due to previous caesarean section followed by failed progress.
18. **LF Van der Voet et al (2014)** proved that a niche is present in 64.5% of women 6-12 weeks after caesarean section, when examined by gel instillation sonohysterography(GIS). Post menstrual spotting is more prevalent in women with a niche and in women with a residual myometrial thickness of <50% of the adjacent myometrium.
19. **Susan Garthus-Niegel et al (2014)** the results suggested that increased post-traumatic stress symptoms in women who preferred delivery by caesarean section compared to women who preferred vaginal delivery. They concluded that to avoid potential trauma, fear of childbirth and maternal requests for a caesarean section should be taken seriously and to be responded adequately.

20. **Marie-Noelle Belanger-Levesque et al (2014)** did a comparative cross-sectional study among 2813 births in 2011. This study highlighted differences in mother's and father's birth satisfaction and in their predictors. They conclude that it is important to take into account the birth experience of each parent and to support parents accordingly by adapting care provision surrounding childbirth.
21. **Costa et al (2013)** analyzed the caesarean section rate evolution in a tertiary hospital and main indications for CS. This study concluded that the decrease in primary caesarean section rate may be attributed to several changes like the induction of labor only after 41st week of gestation in low-risk pregnancies and trial for vaginal birth in maternal-fetal disease should be followed.
22. **Chaegil Lim et al (2013)** did a study on subjects with regular menstrual cycles who underwent taping for a total of six times; twice a week for about 3 weeks, starting from 14 days before menstruation and continuing until its end. The results revealed that kinesiotaping had significant effects on menstrual pain, while spiral taping was effective in alleviating both menstrual pain and premenstrual syndrome.
23. **Katayon Vakilian, Afsaneh Keramat (2013)** this study was conducted to measure the duration of first and second stage of labor in mothers using breathing techniques with lavender aroma. The decrease of length of labor in the active phase was higher in the experimental group.
24. **Hajiamini Z et al (2012)** investigated a study to compare the effects of ice massage, acupressure and placebo in reducing the intensity of labor pain in pregnant women from selected hospitals in Tehran, Iran. This study proved that ice massage and acupressure techniques reduced pain during labor. However, ice massage provided more persistent pain relief.

25. **Mahin Kamalifard et al (2012)** did a quasi-expremental study among 82 primigravidas and randomly divided them into 4 groups, each group receiving massage 1, breathing 1, massage 2, and breathing 2 respectively. This study concluded that massage at 4 and 6cm dilatations and breathing at most dilatations decreased pain scores significantly.
26. **Polly E. Bijur et al (2012)** did a study to find out the reliability of VAS for measuring acute pain. The Intraclass correlation coefficients (ICC) appeared to be high and suggest that VAS is sufficiently reliable to be used to assess acute pain.
27. **Emma L.Barber et al (2011)** proved that the cesarean delivery rate increased from 26% to 36.5% between 2003 and 2009 in USA. Around 50.0% of increase was attributable to an increase in primary caesarean delivery, the indications were – non-reassuring fetal status, labour arrest disorders, multiple gestation, suspected macrosmia, pre-eclampsia, maternal request, maternal fetal conditions and other obstetric conditions**.**
28. **Bedwell C et al (2011)** concluded that there is only limited evidence proving that TENS reduces pain in labour and it does not seem to have any impact on other outcomes for mothers or infants.
29. **Ting Peng et al (2010**) evaluated the efficacy of TENS on four specific acupuncture points Hegu(Li_4), Neiguan (PC_6) Danshu(BL_{19}) and Weishu(BL_{21}) for reducing pain in labor. The percentage of VAS score decreased by >25% was 68% in the TENS treatment group. The incidence of postpartum haemorrhage in the TENS treatment group was less than the control group ($P<0.05$). There were no adverse reactions recorded with TENS on acupoints.

30. **Dowswell T et al (2009)** did a randomised controlled trail comparing women receiving TENS for pain relief in labour versus routine care, alternative pharmacological methods of pain relief or placebo devices. In this study, the TENS group received TENS over the back, acupuncture points and the cranium. Overall, there was little difference in pain rating between TENS and control groups, although women receiving TENS to acupuncture points were less likely to report severe pain. The majority of women using TENS said they would be willing to use it again in a future labour.
31. **Vijayalaxmi K.G. and Asna Urooj (2009)** proved that the influence of age on BMI was statistically significant at 5% level, showing an increasing trend in weight against the gradient of age. The study reinforces the importance of normal weight to maintain good health and also to have better gestational outcome during pregnancy.
32. **Ellise D. Adams and Ann L.Bianchi (2008)** explained that non pharmacologic nursing strategies fall into four categories: physical, emotional, instructional/ informational, and advocacy. Implementation of these strategies requires special knowledge and a commitment to the enhanced physical and emotional comfort of laboring women.
33. **H. Breivik et al (2008)** explained that valid and reliable assessment of pain is essential for both clinical trials and effective pain management. VAS is a one-dimensional pain intensity scale, best suited to measure a patient's subjective feeling of the pain intensity.
34. **Joanne E Lally et al (2008)** explained that a woman's lack of knowledge about the risks and benefits of the various methods of pain relief can heighten anxiety. Woman expected to take control in labor in a number of ways, but their degree of reported control was less than hoped for.

35. **Anne Kirkeby Hansen et al (2007)** concluded that those delivered by elective caesarean section around term have an increased risk of overall and serious respiratory morbidity and also the relative risk increased with decreasing gestational age.
36. **Selina MW Pang et al (2007)** found that the reasons for preferring elective CS among 62 nulliparous women (%) were safer for the baby (33.9), fear of vaginal birth (22.6), less overall pain (17.7), less vaginal trauma (21.0), allows a better control of time of birth (1.6).
37. **An-Shine Chao et al (2007)** investigated the efficacy and safety of TENS on specific acupuncture points for reducing pain in the first satge of labor. This double blind randomized placebo-controlled study showed that TENS application on acupuncture points resulted in significantly better pain relief than placebo in the first stage of labor.
38. **Y. Maeda et al (2007)** tested hat spinal blockade of GABA receptors prevented the anti-hyperalgesia produced by TENS in rats with joint inflammation. The high frequency TENS increases release of GABA in the deep dorsal horn of the spinal cord, and both high and low frequency TENS reduced primary hyperalgesia by activation of $GABA_A$ receptors spinally.
39. **Hilde Nerum et al (2006)** did a study on fear of birth and maternal request for caesarean section among 86 participants 28 of them had moderate fear of birth and 58 had severe fear of birth in which 12 participants had a history of maternal request for caesarean section.
40. **Tina Lavender et al (2006)** concluded that casarean section rates are progressively rising in many parts of the world. One suggested reason is increasing requests by women for planned caesarean section for greater safety for the baby, less pelvic floor trauma for mother, avoidance of labour pain and convenience.

41. **M Habiba et al (2006)** explored the attitudes of obstetricians to perform a caesarean section on maternal request in the absence of medical indication. They emphasized that the motivation, values and fear underlying a women's request for elective caesarean delivery should be considered.
42. **Rani Soren et al (2006)** proved that Emergency CS was associated with significantly more maternal morbidity and adverse neonatal outcome as compared to elective CS. In this study, among 6869 deliveries, 2060 were cesarean delivery, emergency CS rate was 1436/2030(69.70%) and elective CS rate was 624/2060(30.29%).
43. **Britt-Ingjerd Neisheim, Ragnhild Kinge (2006)** proved that women having acupuncture as labor analgesia in the clinical setting have a reduced use of epidural analgesia in Norway. This study supports the findings in the three previously reported randomized controlled trials of acupuncture as an analgesic during labor.
44. **S.N. Mukherjee (2006)** explained that indications for performing CS have changed a lot in recent years such as to avoid painful natural childbirth, to maintain vaginal tone of teenagers; family demands that baby be born on a auspicious date, time. This study concluded that Elective CS had a 2.84 fold greater chance of maternal death as compared to vaginal birth, other intraoperative complications and reduction of future fertility.
45. **Mary E. Hannah (2004)** explained the risks of caesarean delivery were maternal mortality, require a longer recovery time, operative complications at rates varying from 6% for elective cesarean to 15% for emergency cesarean.

46. **Troutt KK (2004)** explained the concept of a pain "neuromatrix" suggested that perception of pain is simultaneously modulated by multiple influences. This article reviewed several non-pharmacological methods of pain relief with implications for the practicing clinician. Providing adequate pain relief during labor and birth is an important component of caring for women during labor and birth.
47. **Thakur Ratna, Patidar Rekha (2004)** did a study among 300 women who were in the active phase of labor without any fetal or maternal complications. They found that 80%in TENS group, 86% in tramadol group and none in the control group achieved significant pain relief. The onset of analgesic effect started in 11.7 minutes and lasted for 3.96 hours in the tramadol group while in TENS group it started in 5.18 minutes and lasted for 3.30 hours.
48. **Lee MK et al (2004)** proved that there was significant reduction in pain and total labor duration in Sp6 acupressure intervention group than in the control group among 75 women in labor. Thus, they concluded that Sp6 acupressure was effective for decreasing labor pain and shortening the length of delivery time.
49. **Penny Simkin, April Bolding (2004)** explained that hospital birth environments, staff training, policies and customs should be modified to accommodate the use of effective non-pharmacologic comfort measures, with the goal of reducing suffering in labor. This can be facilitated with comfort measures that provide sufficient pain relief and enhance the woman's sense of control and her satisfaction with her birth experience.

50. **Ji-Sheng Han (2004)** this study explained that acupuncture and electro-acupuncture (EA) have been accepted as complementary and alternative medicine worldwide mainly for the treatment of acute and chronic pain. The mechanisms of acupuncture effects have led to a major finding in neuroscience that neuropeptides in CNS can be mobilized by electrical stimulation of different frequencies applied at peripheral site.
51. **Gulay Yildirim, Nevin Hotunsahin (2004)** this study demonstrated that nursing support and patient directed education concerning labour and non-pharmacological pain control methods like breathing and cutaneous stimulation techniques were effective in reducing the perception of pain by pregnant women when provided in the latent laour phase before delivery leading to a more satisfactory birth experience.
52. **Mandy Abushama, Badreldwwn Ahmed (2004)** found that the main reason for caesarean section on maternal request was to avoid prolonged labor and maintain fetal well-being.
53. **Britt-Ingjerd Nesheim et al (2003)** proved that acupuncture during labor reduced the requirement for other painkillers and has high patient satisfaction in this randomized, unblended, controlled study.
54. **Ingegerd Hildingsson et al (2002)** proved that among 3061 women, 8.2% prefer to have a caesarean section and they were more depressed and worried about giving birth and also about other things in life. A previous caesarean section, fear of giving birth and a previous negative birth experience were the factors that are statistically associated with a wish for caesarean section.
55. **Jenny A Gamble RN, Dehra K Creedy RN (2001)** proved that among 310 women 219(93.5%) preferred a spontaneous vaginal birth; 20 women (6.4%) preferred a caesarean section. Women who preferred caesarean section were more anxious, poorly informed about the risk associated with caesarean section.

56. **C. Moran et al (2001)** suggested urge caution and vigilance in patients undergoing elective caesarean section particularly in situations of existing cardiac disease. In this study, around 38.5% of patients presented with at least one episode of significant ST-Segment change during their postoperative phase.
57. **Jeffrey L. Ecker (2001)** found that the caesarean delivery rates were higher with increased labor rates of induction rose directly and continuously with maternal age, especially the rate of elective induction. Caesarean deliveries for non-progression of labor or fetal distress were more common among older parturient.
58. **Sylvia T Brown et al (2001)** did a retrospective, descriptive survey design study examined which non-pharmacologic pain-relief techniques laboring women use most often and the effectiveness of chosen techniques. The results provide directions for childbirth educators in designing and implementing an effective childbirth education curriculum that assists women to have empowered birth experience.
59. **J.T.Van der Spank et al (2000)** determined the effect of providing pain relief during labor as well as its influence on incidence of requests for epidural anesthesia. The experimental group received TENS by a burst-conventional obstetric TENS and control group did not received TENS. The study concluded that the TENS group pain scores were significantly lower but no significant differences in incidence of epidural analgesia was found between the experimental and control group.
60. **Albers LL (1999)** proved that the mean length of the active phase of first stage was 7.7 hours for nulliparas and 5.6 hours for multiparas. The mean length of second stage was 54 minutes for nulliparas and 18 minutes for multiparas.

61. **Kaplan et al (1998)** did a study among 104 women which consisted of 46 nulliparas, 58 multiparas. All of them used TENS device for pain relief during labor. TENS significantly reduced pain during labor in nulliparas and also significantly reduced the duration of first stage of labor for nulliparas and multiparas. It significantly decreased the amount of analgesics administered to individual patients.
62. **Sergey Lurie, Jacob Bar (1998)** explained that TENS operates by application of electrical impulses through conductive electrodes placed on the skin. Analgesia is attributed either to an increase in A-fiber transmission, the 'gate theory' of Melzack and Wall or the stimulation of local release of endorphins. TENS has been proved to be generally effective in a variety of conditions, and specifically during labor and delivery.
63. **Michael David Mueller et al (1997)** proved that the frequency of fetal acidemia (pH less than 7.10) was significantly increased in the spinal anesthesia group and in the epidural group among women who underwent elective caesarean delivery with uncomplicated singleton term pregnancies.
64. **Joseph A Adashek et al (1993)** determined factors contributing to the increased use of caesarean section in patients ≥35 years old. The increased oxytocin requirements and the incidence of dystocia with birth weight ≥3600gm suggest that maternal and fetal characteristics contribute to the increased frequency of caesarean section in older parturient.
65. **Ratcliffe FM, Evans JM (1993)** this study compared the Apgar Status of neonates following general (n=34), spinal (n=28) and epidural (n=23) anesthesia for elective caesarean section. The percentage of neonates with a 1 minute Apgar score>7 was 96% after epidural anesthesia, 93% after spinal and 75% after general anesthesia.

66. **Elizabeth et al (1986)** tested the hypothesis that Apgar score is in part related to newborn infant's level of maturity. The 1 and 3 minute Apgar scores were directly related to the fetal well-being.
67. **Thorkild F.Nielson, Klas-Henry Hokegard (1983)** found that among1319 CS, the overall complication rate was 14.5% and the most common complication was infection (13.3%) such as endometritis (6.6%), urinary tract infection (3.1%) and wound infection (1.6%). They also found that there is a lower complication rate seen in elective operations (4.7%) compared with emergency operations (24.2%).
68. **J.J.Bonica (1979)** explained about the peripheral mechanisms and pathways of parturition pain. The nociceptive impulses from uterus pass to the spinal cord via afferent fibers associated with sympathetic nerves and into the spinal cord via the nerve roots of T_{11} and T_{12} during early part of first stage.

Materials and Methodology

CHAPTER 3

3. MATERIALS AND METHODOLOGY:

3.1 STUDY DESIGN:

This is a Quasi-experimental study design.

3.2 STUDY SETTING:

This study was conducted in the Department of Obstetrics and Gynaecology, Sri Ramakrishna Hospital, Coimbatore – 641044, under supervision of the staff in charge, College of Physiotherapy, SRIPMS, Coimbatore. Informed consents were obtained from all patients and were included for the study after prior referral from the obstetrician in charge.

3.3 SAMPLING METHOD:

Primigravid women with a gestation period of >37 weeks and an age range between 20 to 40 years were selected by convenient sampling method.

3.4 SAMPLE SIZE:

A total of 40 primigravid women who fulfilled the inclusion criteria were assigned as Group A (n=20) and they received kinesiotaping with breathing exercises and as Group B (n=20) who received Acu-TENS with breathing exercises.

3.5 STUDY DURATION:

The study duration was 6 months.

3.6 TREATMENT DURATION:

The treatment duration was first stage of labor duration.

3.7 SELECTION CRITERIA:

3.7.1 INCLUSION CRITERIA:

- Primigravid women with a gestation period of >37 weeks and an age range between 20 to 40 years.
- Women during first stage of labor with regular painful, palpable uterine contractions, cervical dilatation 3 to 5cm.
- Women with a normal single fetus in uterus.
- Women with a cephalic presentation.
- Women anticipating normal delivery.
- Women with a normal fetal heart rate.
- Women who had minimum two uterine contractions at every ten minutes.

3.7.2 EXCLUSION CRITERIA:

- Multigravid women
- Women with a history of pre-eclampsia or eclampsia.
- Women with a history of placenta previa.
- Women with multiple pregnancies.
- Women with intrauterine growth retardation of fetus.
- Women with premature rupture of membranes.
- Women with heart or chest diseases.
- Women with breech presentation of fetus.
- Women who had been diagnosed as cephalopelvic disproportion.
- Women with acute viral disease or acute tuberculosis.
- Women with a history of skin abnormalities (skin malignancy or burns in treated area).
- Women with a history of sensory disturbance.
- Women who had a previous history of back surgery.
- Women who had a previous history of vertebral fractures or major spinal structural abnormalities, spondylolisthesis, spinal stenosis.
- Women with metal implants in upper or lower limbs.

3.8 PROCEDURES:

This study was conducted on 40 normal full term primigravid women during first stage of labor. They were selected based on the selection criteria. Participants were screened by an obstetrician before inclusion to the study through a complete obstetrical examination.

The purpose and nature of the study were explained to all primigravid women and to their family and informed consent was obtained.

All primigravid women in this study were allocated to two groups. Twenty participants in Group A received Kinesiotaping with breathing, while 20 participants in Group B received Acu-TENS with breathing.

3.8.1 KINESIOTAPING:

a) Specification: 5cm x 5m kinesiotaping.

b) Preparatory phase:

- The skin was cleaned before the application of tape.
- The skin was rendered free of oils and lotions.
- Body hair were clipped or shaved at the area of application.
- Anything that limited the acrylic adhesive ability to adhere to skin would limit both the effectiveness and length of application.

d) Application phase:

Table – 3: Kinesiotaping 'H' Technique application

STAGE OF LABOR	SITE OF APPLICATION	TECHNIQUE OF APPLICATION	MECHANISM AND DIRECTION	TENSION OF APPLICATION
First stage with cervical dilatation >3cm	Lumbosacral region on bilateral erector spine muscle	"H" Technique	Each participant was asked to flex her back and bilateral kinesio "I" strip was applied on paraspinal muscles at level of T_{10} – S_2.	Overall 15-25% tension applied on tape. But base and tail of tape applied with no tension.
			Third strip was applied horizontally as a space correction technique.	100% tension.

Table - 4 Kinesiotaping 'I' Technique application

STAGE OF LABOR	SITE OF APPLICATION	TECHNIQUE OF APPLICATION	MECHANISM AND DIRECTION	TENSION OF APPLICATION
First stage with cervical dilatation >7cm	Anterior lower abdomen region	"I" Technique	Tape was wrapped from left lateral side of the last 3 ribs laterally towards the anterior lower abdomen then backwards, towards the right lateral side of the last 3 ribs laterally.	Overall 25% tension applied on tape. But base and tail of tape applied with no tension.

d) Removing phase:

- Remove tape in the direction of hair growth.
- Remove away from the center of the body on the trunk.
- To minimize discomfit, press the skin at the end of the taped area while gently peeling tape back.
- Tape can be loosened by soaking with baby oil, vegetable oil for 5-10 minutes before removing.

Fig. 4 Kinesiotaping ‘H’ technique

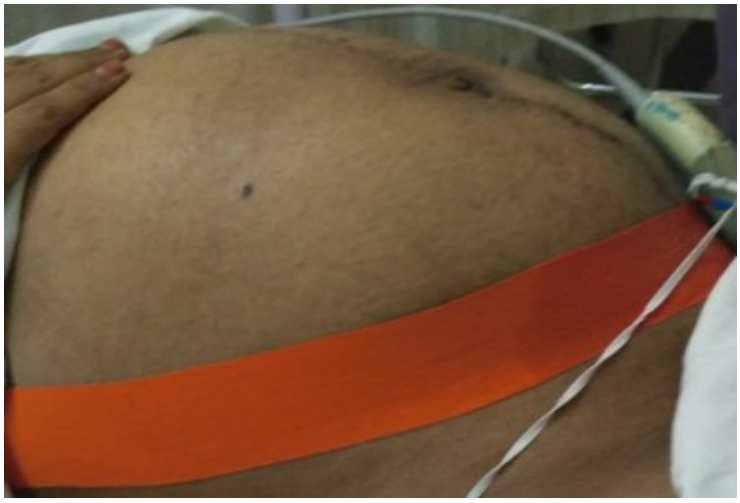


Fig. 5 Kinesiotaping ‘I’ technique

3.8.2 Acu-TENS:

A portable TENS unit with two pairs of rubber electrode pads measuring 30x30mm were placed on the subject`s skin over specific acupressure points.

ELECTODE PLACEMENT:

- Hegu point (Li4) of both hands – midpoint between first and second carpal bone, first web space dorsal side.
- Sanyinjiao point (Sp6) of both legs – 5cm above medial malleolus in lower leg.

Table. 5 PARAMETERS USED IN ACU-TENS	
Output intensity	The current output was individually titrated with intensity at a range between 10 and 18 mA, to elicit a tingling sensation.
Frequency	100Hz with a burst frequency of 2Hz.
Pulse duration	0.25ms.
Duration	Throughout the first stage of labor (>3cm to full cervical dilatation).

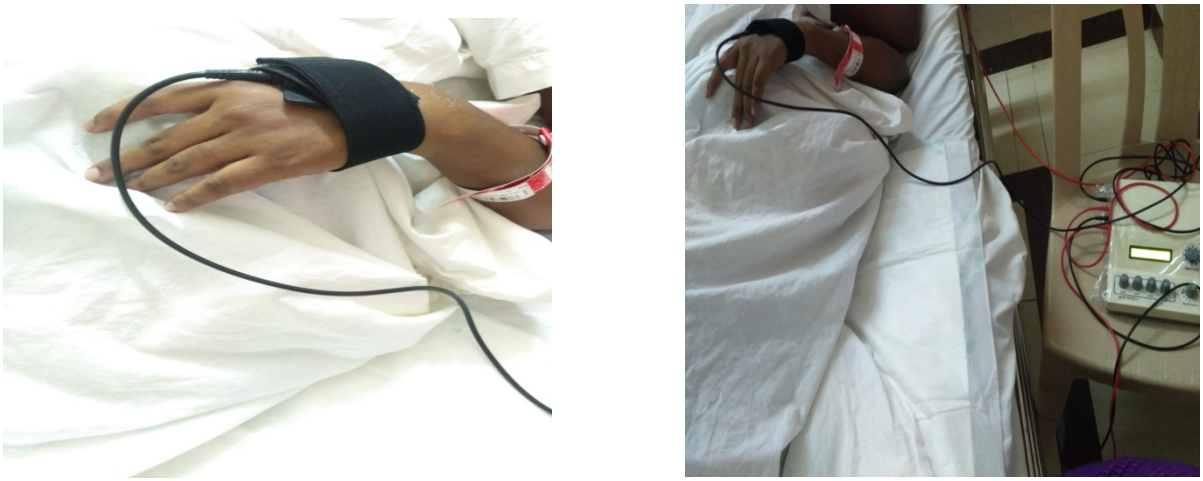


Fig. 6 Acu-TENS over Li4 Acupoints

Fig.7 Acu-TENS over Sp6 Acupoints

3.8.3 BREATHING EXERCISE:

Participants in both groups A and B performed breathing exercises during uterine contractions in their first stage of labor.

a) Diaphragmatic breathing:

- The subject was asked to choose a preferred comfortable position and instructed to relax completely then place her hands over the abdomen.
- The therapist asked her to take a deep breath from her nose, make her abdomen like a balloon and then exhale the air out slowly from her mouth with a sigh and relax.

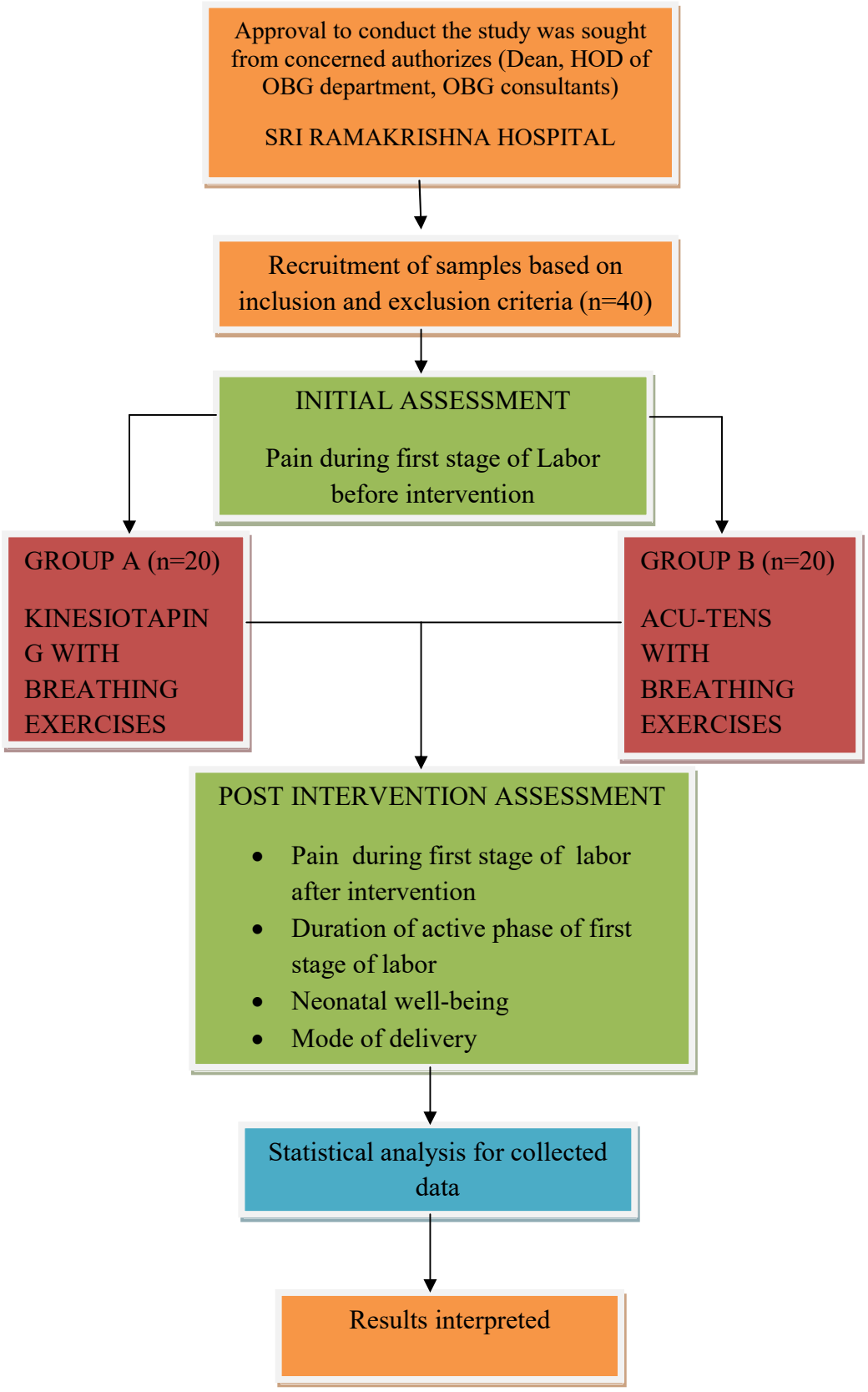
b) Costal breathing exercise:

- When uterine contractions became stronger and frequent as the cervical dilatation increased, the therapist asked the subject to perform costal breathing exercise.
- From any comfortable position, the therapist asked the subject to take a deep breath from her nose, and then open out her ribs and exhale the air out from her mouth with a sigh slowly and relax.

Fig.8 Diaphragmatic breathing exercise during labor

Fig.9 Costal breathing exercise during labor

3.9 STUDY METHODOLOGY:



3.10 VARIABLES:

3.10.1 INDEPENDENT VARIABLES:

- Kinesiotaping
- Acu-TENS
- Breathing exercises

  a) Diaphragmatic breathing

  b) Costal breathing

3.10.2 DEPENDENT VARIABLES:

- Maternal and neonatal outcomes

3.11 OUTCOME MEASURES:

- Labor pain intensity level
- Duration of active phase in the first stage labor
- Mode of delivery
- Neonatal well-being

3.12 MEASUREMENT TOOLS:

3.12.1 VISUAL ANALOGUE SCALE:

A VAS was used to assess the pain intensity level during first stage of labor. It is a 10cm horizontal line with one end described as no pain (score 0) and the other end described as worst pain (score 10).

a) VAS for Group A (Kinesiotaping with breathing exercises):
   The VAS assessment was performed before and after the application of kinesiotaping 'H' Technique while cervical dilatation was 3-5cm and 'I' Technique while cervical dilatation between 7-8cm.
b) VAS for Group B (Acu-TENS with breathing exercises):
   Participants were asked to estimate how painful they felt during the last contractions before application of Acu-TENS and after 30 and 60 minutes post Acu-TENS application.

3.12.2 STOPWATCH:

It was used to measure the duration of active phase of labor first stage, which is defined as the time between cervical dilatation $\geq$3cm to $\leq$5cm and complete dilatation.

3.12.3 APGAR SCORE:

It was used to assess the neonatal well-being. Apgar score at 1 minute and 5 minutes after birth were measured.

3.12.4 HOSPITAL BIRTH RECORDS:

Mode of delivery was noted from the hospital birth records.

3.12.5 OTHERS:

- Kinesiotape
- TENS machine
- Power cable
- Rubber electrodes
- Aqua gel
- Stopwatch
- Cotton
- Micropore

Fig.10 Materials used for Group A

Kinesiotape

Scissor

Stopwatch

Cotton

Fig. 11 Materials used for Group B

ACU-TENS

Power cable

Leads

Rubber electrodes

Aqua gel

Micropore

Cotton

3.13 STATISTICAL ANALYSIS:

- Statistical package for the social sciences (SPSS) computer program (version 20) for Windows was used for data analysis.

- Descriptive Statistics:
  - Descriptive statistics for the dependent measures, including means and standard deviations, were calculated for the age, BMI and gestational age, mode of delivery.
  - The formula for calculating the mean is,

$$\bar{d} = \frac{\sum d}{n}$$

Where,

$\sum d$ = sum of each value

n = total number of subjects

  - The formula for calculating the standard deviation of differences is,

$$sd = \sqrt{\frac{\sum d^2 - n\ (\bar{d})^2}{n-1}}$$

Where, n-1 is the degree of freedom for testing the hypothesis.

- Paired ‘t’-test:
  - Used to test the differences of same subjects: Pre-Post comparison
  - To find out any statistical difference between VAS Score, among primigravidas in both Group A and B.
  - The formula for calculating the Paired t test is,

$$\text{Test statistics (t)} = \frac{\bar{d}}{sd / \sqrt{n}}$$

Where,

$\bar{d}$ = mean difference

sd = standard deviation

n = total number of subjects

- Independent ‘t’ test:
  - Used to compare between two means.

$$\text{Test statistics (t)} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\left[\frac{1}{n_1} + \frac{1}{n_2}\right]}}$$

Where,

$\bar{x}_1, \bar{x}_2$ = means of two groups

n_1, n_2 = number of observations in two groups

s_1^2, s_2^2 = variance of both the groups

Degrees of freedom: (df) = $n_1 + n_2 - 2$

- Accept the null hypothesis, if calculated‘t’ value is less than the tabulated value at 0.05 (α) level for two tailed hypothesis.

RESULTS

CHAPTER 4

RESULTS

4.1 DATA ANALYSIS:

Data analysis is a method by which the validity of a research study is evaluated and is essential for constructing the validity of a research study purpose. It requires a number of closely related operations beginning from the establishment of a category to raw data through coding, drawing statistical inferences and also finally tabulation of the data that have been collected.

A total of 40 primigravid women with a gestation period of >37 weeks and an age range between 20 to 40 years who fulfilled the inclusion criteria were selected by convenient sampling method, then assigned as Group A (n=20), who received kinesiotaping with breathing exercises and as Group B (n=20), who received Acu-TENS with breathing exercises.

Data collected were statistically analysed and the data is reported as mean $\pm$ SD. Paired 't' test and independent 't' tests were used to find out the statistical differences. The 'p' value was set at < 0.05. Statistical package for the social sciences (SPSS) computer program (version 20) for Windows was used for data analysis.

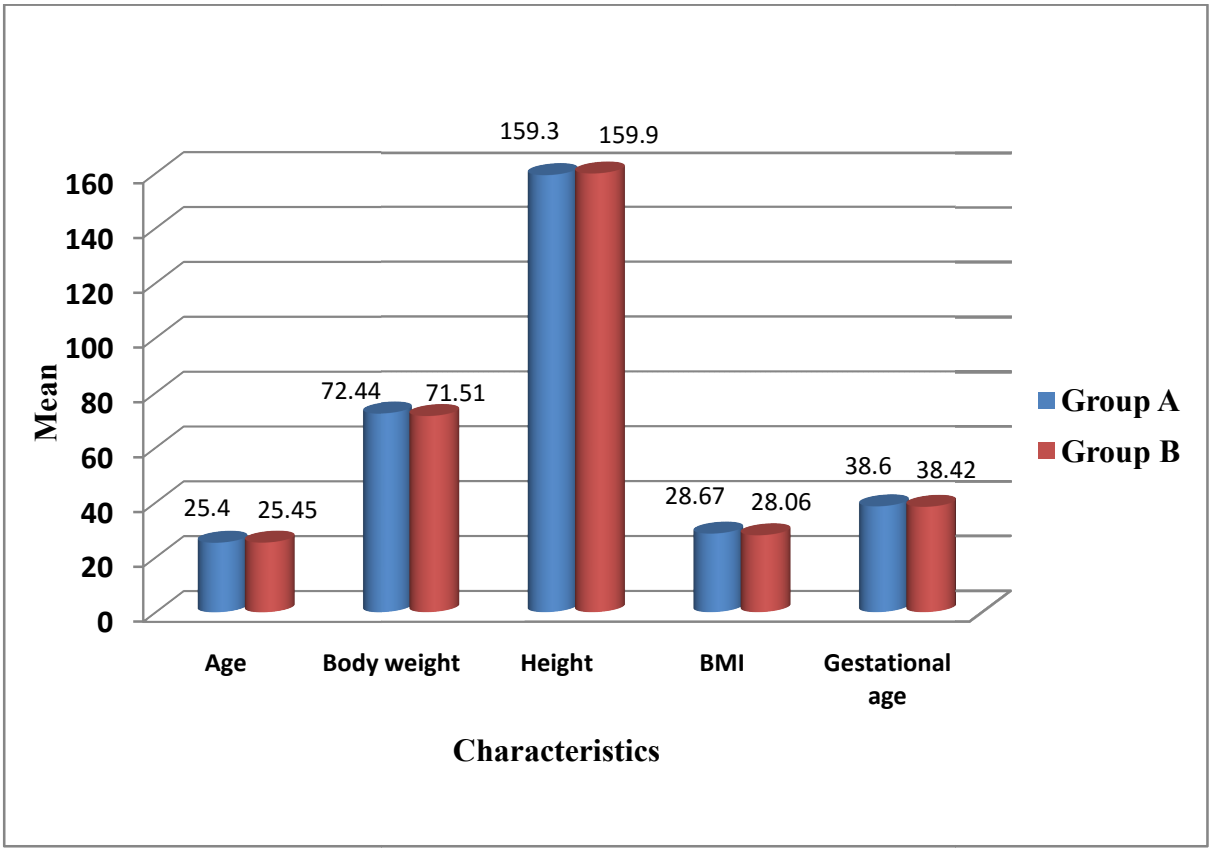
4.2 DATA INTERPRETATION:

Interpretation of data means to examine the results from the data analysis, where it forms the conclusion and also exploring the significance of the findings and also suggesting further studies.

TABLE – 6: DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS IN GROUP A & B

Characteristics	Group A	Group B	t-value	p-value	Significance
	Mean ± SD	Mean ± SD			
Age (years)	25.4 ± 2.257	25.45 ± 2.481	-0.067	0.947	NS
Body weight (kg)	72.44 ± 10.65	71.51 ± 8.869	0.300	0.766	NS
Height (cm)	159.3 ± 5.486	159.9 ± 4.483	-0.410	0.684	NS
BMI (kg/m^2)	28.67 ± 4.688	28.06 ± 4.008	0.442	0.661	NS
Gestational age (weeks)	38.6 ± 1.06	38.42 ± 1.094	0.529	0.600	NS

GRAPH – 1: DEMOGRAPHIC CHARACTERISTICS FOR GROUP A AND B



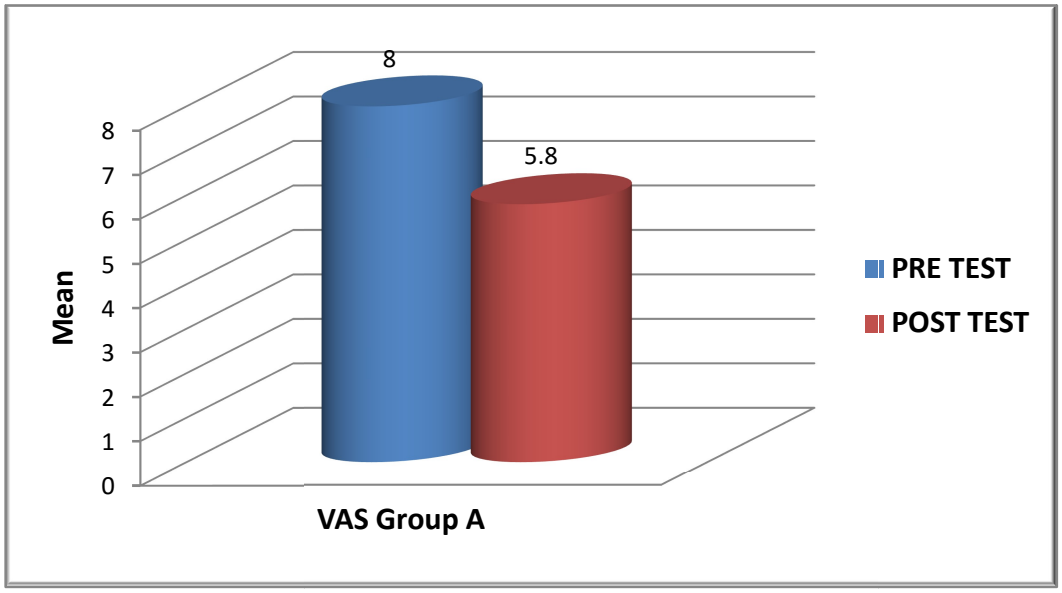
In group A, the mean age of subjects was 25.4 years (SD = 2.257), mean weight was 72.44 kg (SD = 10.65), mean height was 159.3 cm (SD = 5.486), mean BMI was 28.67 kg/m^2 (SD = 4.688) and mean gestational age was 38.6 weeks (SD = 1.06) whereas in group B, the mean age of subjects was 25.45 years (SD = 2.481), mean weight was 71.51 kg (SD = 8.869), mean height was 159.9 cm (SD = 4.483), mean BMI was 28.06 kg/m^2 (SD = 4.008) and mean gestational age was 38.42 weeks (SD =1.094).

The demographic characteristics between group A and B were analyzed using independent 't' test. There were no significant differences in age (years), weight (kg), height (cm), BMI (kg/m^2) and gestational age (weeks) between the two groups. This shows that the samples were homogenous among the groups.

TABLE - 7: COMPARISON OF VAS VALUES BEFORE AND AFTER KINESIOTAPING (GROUP A)

S. No	VAS	PAIN VALUES			't' Value	Sig (2-tailed) (p<0.05)
		Mean	Mean Difference	S.D		
1	Pre test	8.000	2.2	1.486	8.543	0.000
2	Post test	5.800		1.989		

GRAPH - 2: VAS SCORES – PRE & POST TEST VALUES IN GROUP A

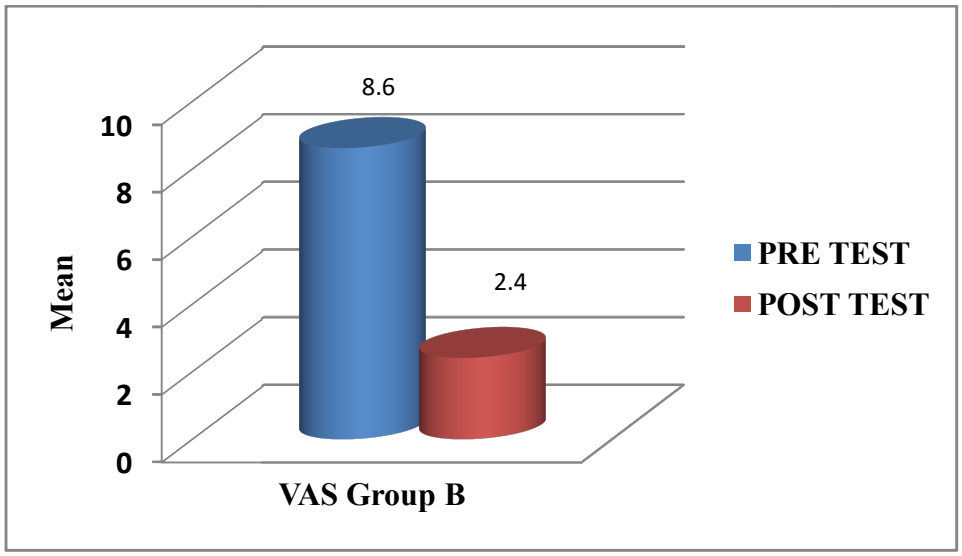


Pre-test and post-test values of VAS in group A was analyzed using the paired 't' test. The mean value for pain in subjects of group A before the intervention is 8.000 whereas the mean after intervention is 5.800 which are lesser than the pre-test mean value; the 'p' value is 0.000 which is < 0.05. There is a significant change in the VAS scores when compared before and after the intervention in subjects who received kinesiotaping with breathing exercises.

TABLE – 8: COMPARISON OF VAS VALUES BEFORE AND AFTER ACU-TENS (GROUP B)

S. No	VAS	PAIN VALUES			't' Value	Sig (2-tailed) (p<0.05)
		Mean	Mean Difference	S.D		
1	Pre test	8.600	1.25	0.9947	12.583	0.000
2	Post test	7.350		1.039		

GRAPH – 3: VAS SCORES – PRE & POST TEST VALUES IN GROUP B

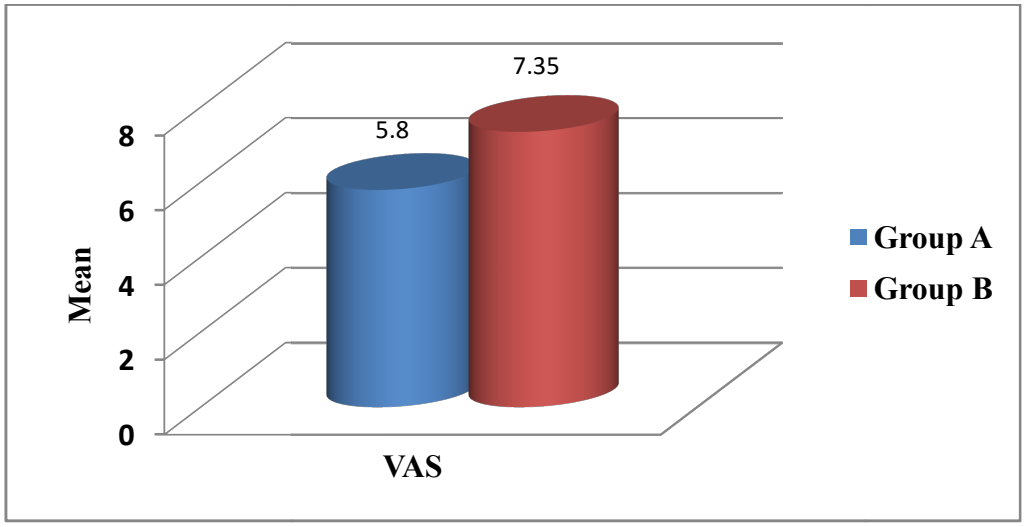


Pre-test and post-test values of VAS in group B was analyzed using the paired 't' test. The mean value for pain in subjects of group B before the intervention is 8.600, whereas the mean after intervention is 7.350 which are lesser than the pre-test mean value; the 'p' value is 0.000 which is < 0.05. There is a significant change in the VAS scores when compared before and after intervention in subjects who received Acu-TENS with breathing exercises.

TABLE – 9: POST TEST VALUES OF VAS BETWEEN GROUP A & B

S. No	Post test values of VAS	PAIN VALUES			't' Value	Sig (2-tailed) (p<0.05)
		Mean	Mean Difference	S.D		
1	Group A	5.800	-1.55	1.989	-3.088	0.004
2	Group B	7.350		1.039		

GRAPH – 4: VAS SCORES – POST TEST VALUES BETWEEN GROUP A & B

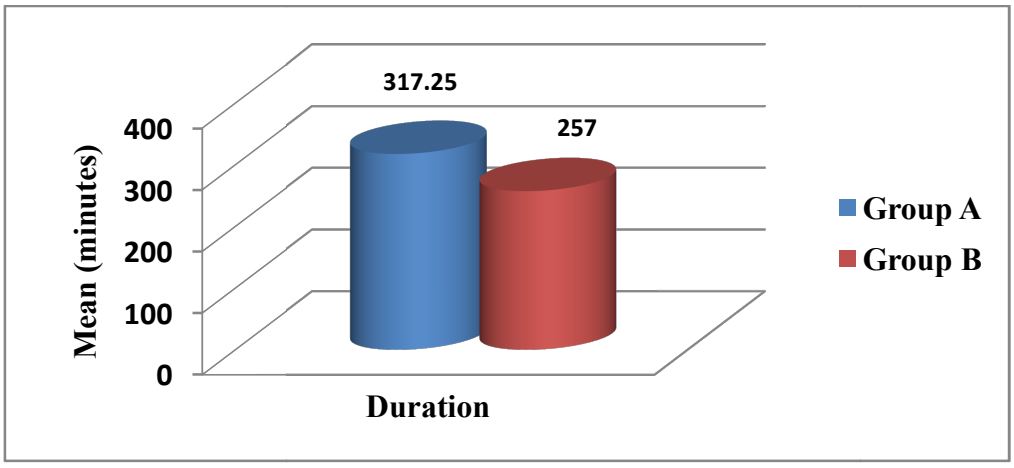


Post-test values of VAS for group A and B were analyzed by independent't' test. The mean value of post-test VAS of group A is 5.800 which are lesser than the mean value of post-test value of group B, the value being 7.350. The 'p' value obtained is 0.004 which is < 0.05. Therefore the null hypothesis is rejected. There is a significant change in the pain intensity level between group A and group B subjects where group A showed more significant reduction in VAS score during the first stage of labor.

TABLE – 10: VALUES OF ACTIVE PHASE OF FIRST STAGE LABOR DURATION BETWEEN GROUP A & B

S. No	Post test values of Labor duration	DURATION			't' Value	Sig (2-tailed) (p<0.05)
		Mean	Mean Difference	S.D		
1	Group A	317.25	60.25	269.26	1.010	0.319
2	Group B	257.00		165.43		

GRAPH – 5: ACTIVE PHASE OF FIRST STAGE LABOR DURATION BETWEEN GROUP A & B

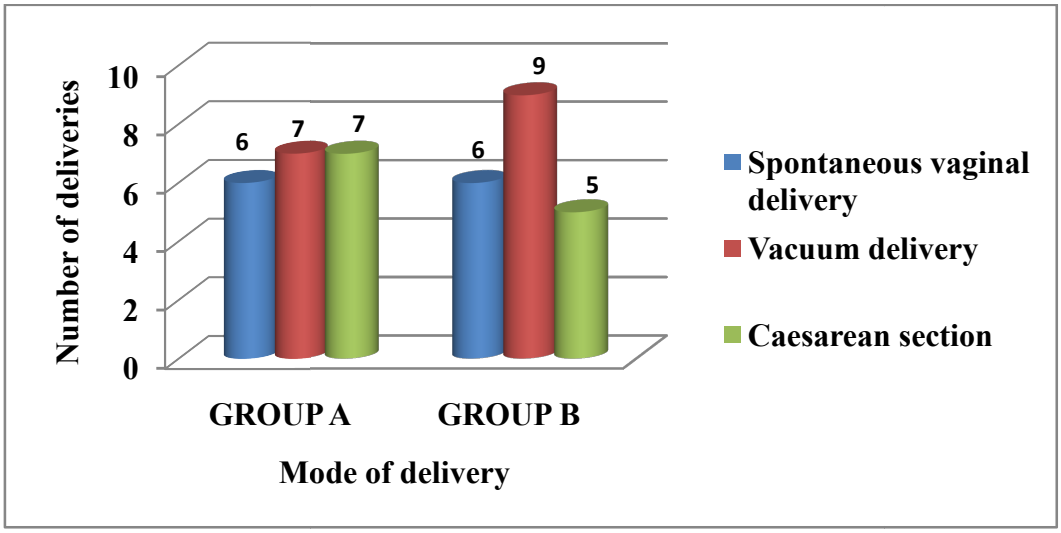


Post-test values of the active phase of first stage labor duration for group A and B were analyzed by independent't' test. The mean value of post-test duration of group A is 317.25 which are greater than the mean value of the post-test value of group B, the value being 257.00. The 'p' value obtained is 0.319 which is > 0.05. Therefore the null hypothesis is accepted. There is no significant change in the duration of active phase of first stage labor between group A and group B subjects.

TABLE – 11: MODE OF DELIVERY BETWEEN GROUP A & B

MODE OF DELIVERY	GROUP A	GROUP B
Spontaneous vaginal delivery	6 (30%)	6 (30%)
Vacuum delivery	7 (35%)	9 (45%)
Caesarean section	7 (35%)	5 (25%)

GRAPH – 6: MODE OF DELIVERY BETWEEN GROUP A & B

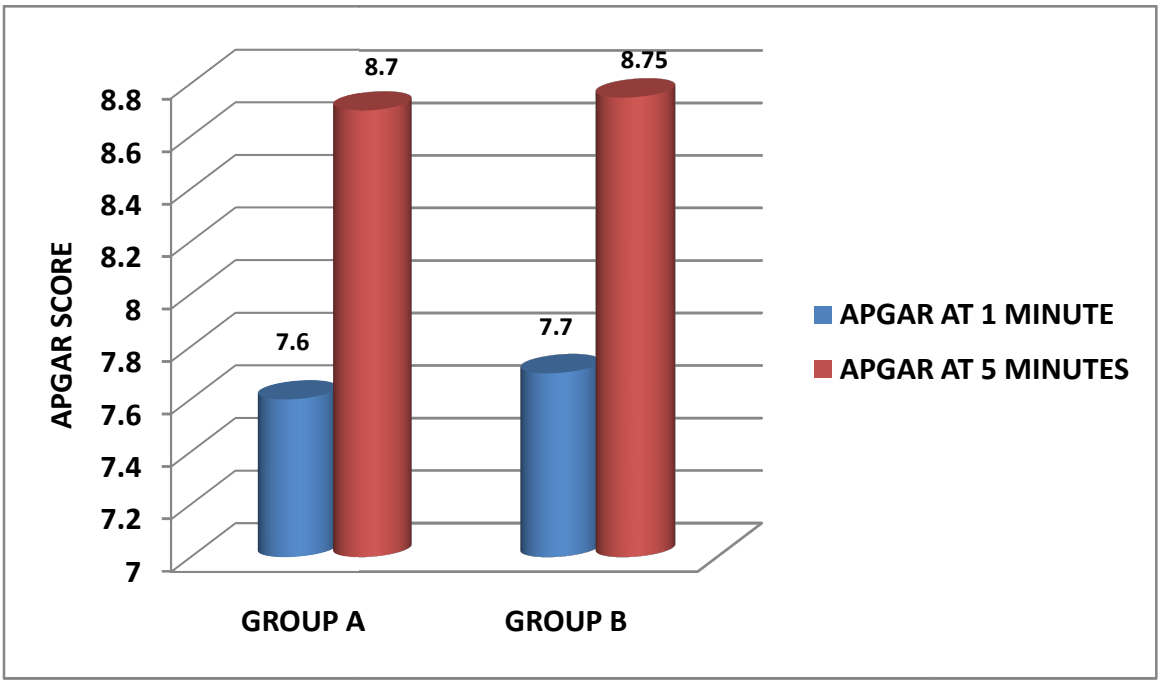


In both the groups 6 cases had spontaneous vaginal delivery. Use of operative delivery was increased in group A (35% [7/20]) than in group B (25% [5/20]). Four emergency caesarean sections in group A and B were due to non-progression of labor, one case in group A and B due to fetal distress, one case in group A had arrest of dilatation with non-assuring fetal heart rate and one case in group A had prolonged 2nd stage of labor. Use of vacuum delivery was increased in group B (45% [9/20]) than in group A (35% [7/20]). Two cases in group A and B underwent this procedure due to maternal exhaustion. Four cases in group A and seven in group B were due to poor maternal effort, one case was indicated for this procedure due to prolonged 2nd stage of labor in group A.

TABLE – 12: VALUES OF APGAR SCORES BETWEEN GROUP A & B

VALUES OF APGAR	APGAR			't' Value	Sig (2-tailed) (p<0.05)
	Mean	Mean Difference	S.D		
APGAR AT 1 MINUTE					
GROUP A	7.60	-0.1	0.753	-0.406	0.687
GROUP B	7.70		0.801		
APGAR AT 5 MINUTES					
GROUP A	8.700	-0.05	0.470	-0.282	0.780
GROUP B	8.750		0.638		

GRAPH.6 APGAR SCORES BETWEEN GROUP A & B



The mean Apgar scores at 1 minute and 5 minutes of each group were almost similar. At 1 minute post-delivery, in group A there were fifteen babies having score 8, two babies had score 7, three had score of 6 whereas in group B seventeen babies had score 8, one had score 7, one had score 6, one had score 5. At 5 minutes post-delivery, in group A fourteen babies had score 9, six babies had score 8 whereas in group B seventeen babies had score 9, one baby had score 8, two babies had score 7.

Based on the above results, both the interventions given in group A and B were individually effective in reducing pain and the duration of active phase in first stage labor and also reduced caesarean section rate among groups, which was shown by the intra-group analysis. However, the inter-group analysis shows that there is significant difference between the groups in terms of VAS score, where group A is more significant in reducing pain during first stage of labor. But there is no significant difference between groups in the duration of active phase of first stage labor, Apgar score at 1 minute and 5 minutes post-delivery. Caesarean section rate was slightly increased in group A when compared to group B.

Discussion

CHAPTER 5

DISCUSSION:

Pain relief in labor is a unique problem. Individual pain perception depends on the intensity and duration of the uterine contraction, the speed with which the cervix dilates the physical condition of the woman as well as a complexity of emotional factors such as previous experiences, present expectations and cultural factors [26]. This also plays a part in the length of labor and therefore the ability of a mother to manage without invasive analgesia. Women with high pain scores and distress-related thoughts during labor's latent phase had longer labors and were more likely to need instrumental delivery. Maternal distress during this time related to higher incidences of abnormal fetal heart rate patterns and need for neonatal assistance [22].

During labor having fear of pain leads to pain fear cascade, a reaction that increases catecholamine release. Among the catecholamines, adrenaline has a particular ability of promoting vasoconstriction and stopping oxytocin production. High levels of catecholamine decrease effective uterine contraction and placental blood flow, which can lead to exhaustion, dystocia, fetal suffering and postpartum post-traumatic stress disorder [25].

Only a small percentage of women who deliver in hospitals receive no pain medications. The most frequently employed form of pain control during labor is epidural analgesia, followed by narcotics. Although these agents apparently meet the needs of most parturients, they are not without contraindications and complications. This was the rationale for our search for an alternative, safe and non-pharmalogical method of intrapartum pain relief [28].

Non pharmacological approaches such as kinesiotaping, ACU-TENS and breathing exercises can promote better pain management, lesser anxiety and encourage active participation of women in the decision making process, with the aim of positive child birth experiences.

Kinesiotaping provided an optimizing treatment that can minimize the development of pain, which accounts for serious costs during labor. There is very little clinical experience and only limited documentation for effectiveness of kinesiotaping on labor pain and childbirth duration. One of the key actions of kinesiotaping is suppression of pain by stimulation of the tactile fibers in the skin through the pain gate mechanism [43, 55] .

This study showed that kinesiotaping significantly reduced labor pain and active phase of first stage labor duration without any adverse effect to both mother and neonate. Consistent with our study **Ghada E. El-Refaye et al** studied kinesiotaping effect combined with breathing exercises on childbirth duration and labor pain and they reported high significance in reducing labor pain and shortening the duration of the first stage of labor [2]. **Maria Amelia Miquelutti et al** reported that kinesiotaping provided significant reduction in pain score and length of active phase during labor with no adverse effects to both the mother and neonate [25]. Therefore, the effectiveness of kinesiotaping on pain control and length of active phase during labor may be via stimulation of neurological system such as skin receptors constantly being activated, so they might act on both superficial and deep tissues and promote pain relief through the gate control theory of pain, as proposed by Melzack and Wall (1965) [25] and also by microscopically lifting the skin where the taped portion forms convolutions in the skin, thus increasing interstitial space. The result is that pressure and irritations are taken off the sensory and neural receptors, alleviating pain [2].

TENS on acupuncture points for pain relief during labor was designed for this study to work by a combination of the central and peripheral actions to release much more endogenous opioid peptides. Hegu (Li 4) on both hands and Sanyinjiao (Sp 6) points on both legs were chosen because these were one of the traditional acupuncture points used in relieving labor pain that would not interfere with obstetrical practice [26]. Patients who have used TENS for pain relief during labor, have expressed their satisfaction and no pathological FHR tracing or adverse effects on the newborn have been noted.

This study showed that Acu-TENS significantly reduced labor pain and active phase of first stage labor duration without any adverse effect to both mother and neonate. Consistent with our study **An-Shine Chao et al** researched about pain relief by applying TENS on acupuncture points during the first stage of labor and reported VAS score reduction $\geq$3 significantly, but there is no significant difference in first stage labor duration without any adverse effects on neonatal outcomes [26]. **Ting Peng et al** reported that TENS over Hegu (Li 4) reduced VAS score by > 25% during labor, the incidence of postpartum hemorrhage and there was no adverse reaction recorded with TENS on acupoints [44]. **Kaplan et al** reported that TENS significantly reduced the duration of first stage of labor for nulliparas, the amount of analgesic drug administered and there were no adverse effects on mothers or newborns. **Bedwell et al** studied about the use of TENS for pain relief in labor and proved that patients who were administered TENS to acupuncture points were less likely to report severe pain [45]. **Mollart et al** examined impact of acupressure on onset of labor and labor duration and reported that acupressure may reduce length of labor particularly, the first stage [49]. **Lee MK et al** reported that acupressure on Sp6 significantly reduced labor pain scores and duration of labor [47].

TENS unit sends electrical impulses through electrode pads usually placed on or near the skin at painful points. Analgesia is thought to achieve either by blocking pain impulses to the brain by increasing A-β fibre transmission (gate theory) or by stimulating the local release of endorphins. Melzack and Wall (1965) suggested that pain was controlled by the closing of spinal cord "gate" through activities of nerve cells in cord with modulation by higher centers. Differential release of opioid peptides in central nervous system by TENS has been noted, with a frequency of 2 Hz triggering the release of enkephalins and β-endorphins and 100 Hz stimulation selectively increasing the release of dynorphin in the spinal cord. A combination of both frequencies allows synergistic interaction among the three endogenous opioid peptides and provides a powerful analgesic effect [26].

Breathing exercise is considered as a key for relaxation and to reduce labor pain as it can assist the women to cope with the pain of uterine contractions as well. In this study, breathing exercises were done with combination of other treatment techniques which was useful in reduction of labor pain and lessen the anxiety level of primigravidas. Consistent with our study, **Kamali Frad et al** and **Tafazoli at el** showed that breathing techniques in 4, 6 and 10 cm dilation significantly minimized labor pain and reduced cesarean rate. The results showed that breathing significantly shortened the first stage of labor and decreased the need for induction, but had no significant effects on Apgar score. **Yildirim and Sahil** studied the effects of breathing and skin stimulation techniques on labor pain. They concluded that breathing and cutaneous stimulation techniques when provided in the latent labor phase were effective in decreasing pain perception by pregnant women during labor, resulting in a better satisfactory birth experience [2].

Conclusion

CHAPTER 6

CONCLUSION:

This quasi-experimental study showed that kinesiotaping with breathing exercises (Group A) resulted in significantly better pain relief than ACU-TENS with breathing exercises (Group B) in the first stage of labor among primigravidas. But there is no significant difference between the two intervention groups in terms of duration of active phase of first stage labor, Apgar score at 1 minute and 5 minutes post-delivery. Caesarean section rate was slightly increased in group A compared to group B. No obvious adverse effects in maternal and neonatal outcomes were noted between the groups. Kinesiotaping and ACU-TENS combined with breathing exercises could be used as adjunct for pain control in the first stage of labor for primigravidas.

Limitations and Recommendations

CHAPTER 7

7.1 LIMITATIONS OF THE STUDY:

- Sample size taken in this study was small.
- There is no control group in this study.
- The study was conducted only for primigravid women.
- The primary limitation was the difference between the individual participants in their ability to tolerate labor pain as well as the psychological status of the pregnant women during the treatment period.

7.2 RECOMMENDATIONS:

- Study can be done with the larger sample size.
- Study can be done with multiparous women.
- Effectiveness of other non-pharmacological interventions can be compared.

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CHAPTER 8

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Appendices

CHAPTER 9

APPENDIX 1

ASSESSMENT FORM

SUBJECTIVE EXAMINATION:

Name:

Age:

IP NO:

Date of admission:

Date of assessment:

Consultant name:

Admitted from: OPD/Emergency

HISTORY COLLECTION:

Source of history:

Chief complaints:

History of present illness:

Past medical history: (with duration)

CONDITIONS	DURATION	CONDITIONS	DURATION
Hypertension		Diabetes mellitus	
Cardiac disease		Hypothyroidism	
Respiratory conditions		Others	

Surgical history/past procedures:

HISTORY OF PROCEDURES	YES	NO
Abdominal surgery/ Spine surgery		
Hysteroscopy/Hysterosalphingogram/Laproscopy/Laprotomy		
Salphigectomy/Polypectomy		
IVF		
Others		

Current medications:

NAME OF THE MEDICATION	DOSAGE & ROUTE	FREQUENCY

Family history:

HYPERTENSION	DIABETES MELLITUS	CAD	ASTHMA	COPD	CANCER	OTHERS

Personal history:

Habits	Tobacco / Ethanol / Drugs / Any others
Bowel & bladder	
History of abuse	

Allergies:

FOODS	DRUGS	OTHERS

OBSTETRIC AND GYNAECOLOGICAL HSTORY

Menstrual history:

Menarche: _____years

Menstrual cycle: Duration:

- Regular / Irregular
- Scanty / Moderate / Profuse
- Painless / Painful

Last menstrual period:

Marital history:

Married/unmarried

Marital status:_____years

Non-consanguineous marriage/consanguineous marriage____(degree)

Obstetric history:

G P L A

Last menstrual period:

Estimated date of delivery:

Present pregnancy:

Immunization: Yes/ No

1st Trimester:

2nd Trimester:

3rd Trimester:

Foetal position:

Recent investigations:

PHYSICAL EXAMINATION

Built: Ectomorph/ Mesomorph/ Endomorph

Weight:

Height:

Vital signs:

- Temperature:
- Blood pressure:
- Pulse:
- Respiration:

Skin / Vascular / Extremities Examination:

Abdominal examination:

Inspection:

Palpation:

Auscultation: Foetal heart sounds

Presentation and position of foetus:

LABOR ASSESSMENT

OB Score: Conducted by:

Date:

Time:

Gestational age:

Mother blood group:

Induction: Yes / No If yes,

Induction Delivery Interval:

PV Examination:

Cervical dilatation(cm)	Effacement	Uterus contraction	Membrane	Vertex (station)	Time

Maternal complications:

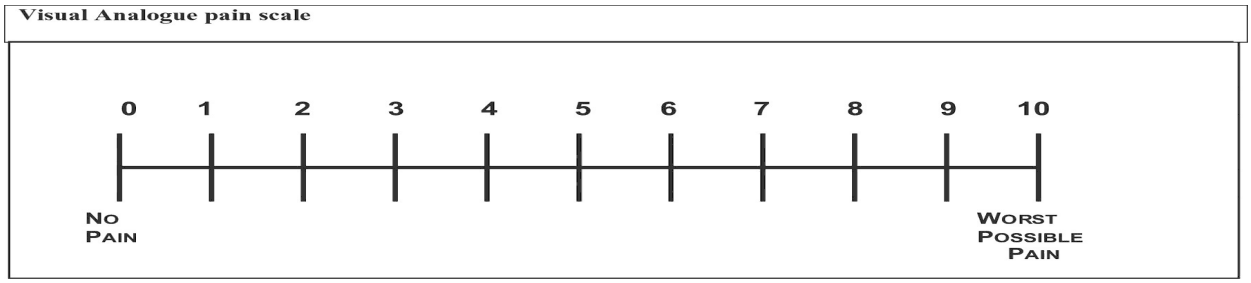
Physiotherapy treatment:

Group A: Kinesiotaping with breathing ☐

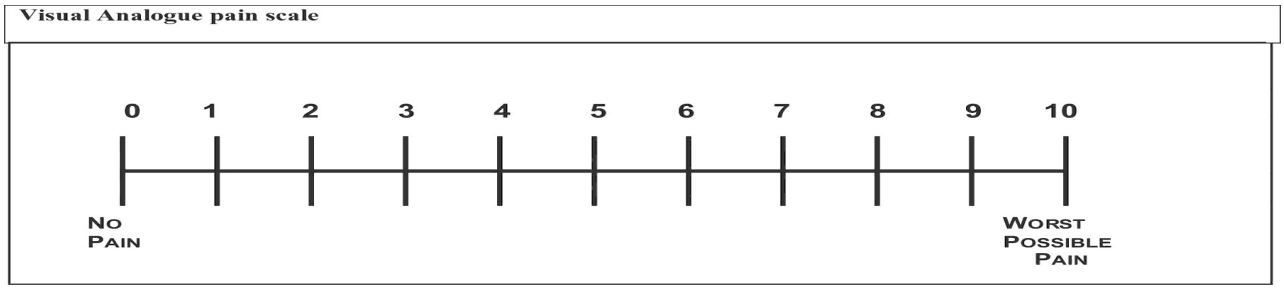
Group B: ACU-TENS with breathing ☐

Pain assessment for Group A:

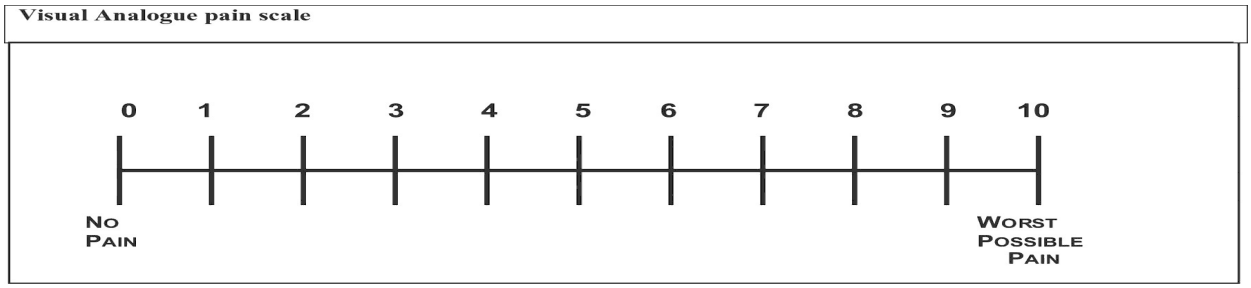
BEFORE ‘H’ TECHNIQUE KINESIO-TAPING APPLICATION



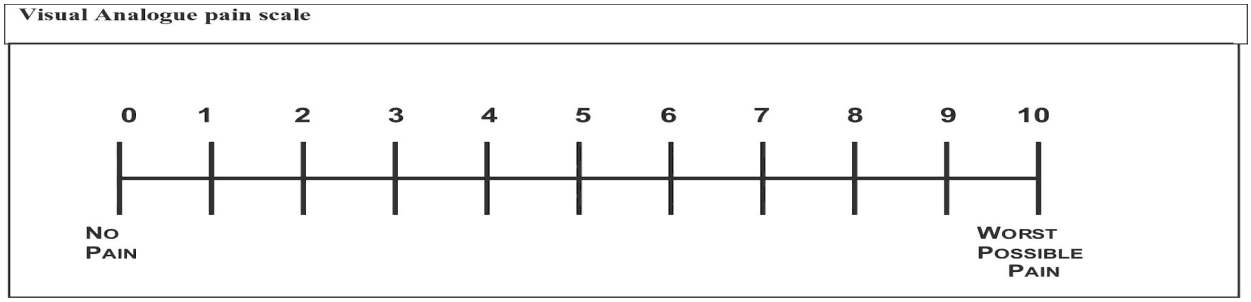
AFTER ‘H’ TECHNIQUE KINESIO-TAPING APPLICATION



BEFORE ‘I’ TECHNIQUE KINESIO-TAPING APPLICATION

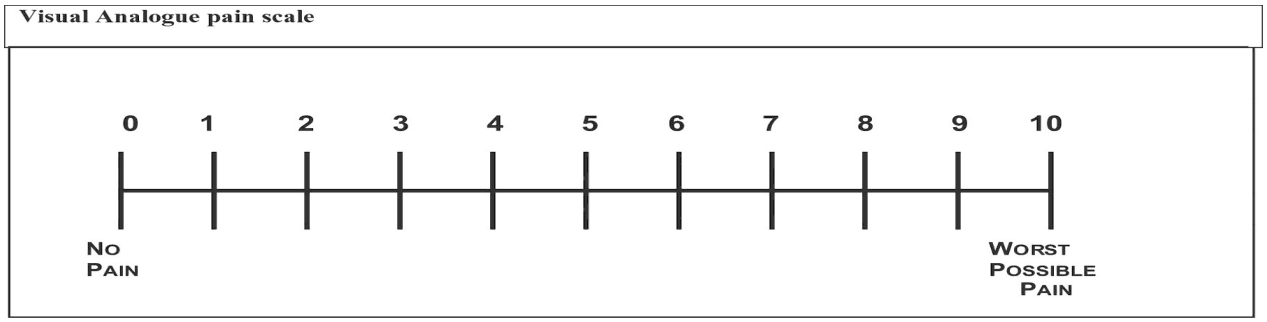


AFTER ‘I’ TECHNIQUE KINESIO-TAPING APPLICATION

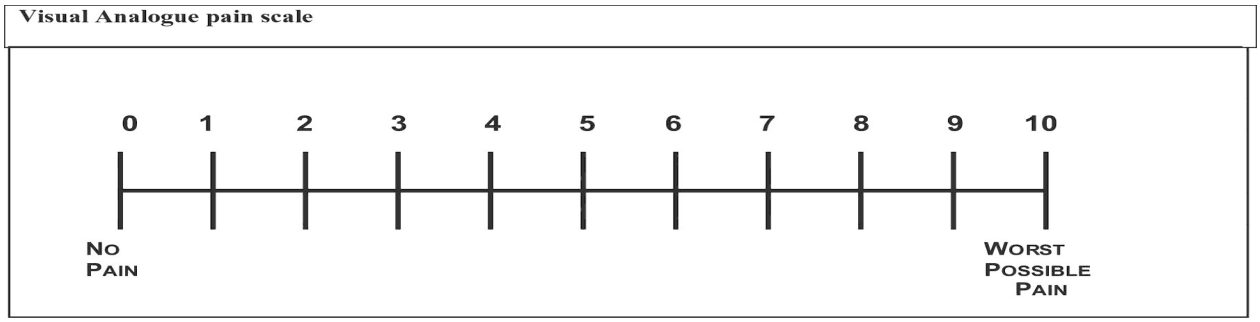


Pain assessment for Group B

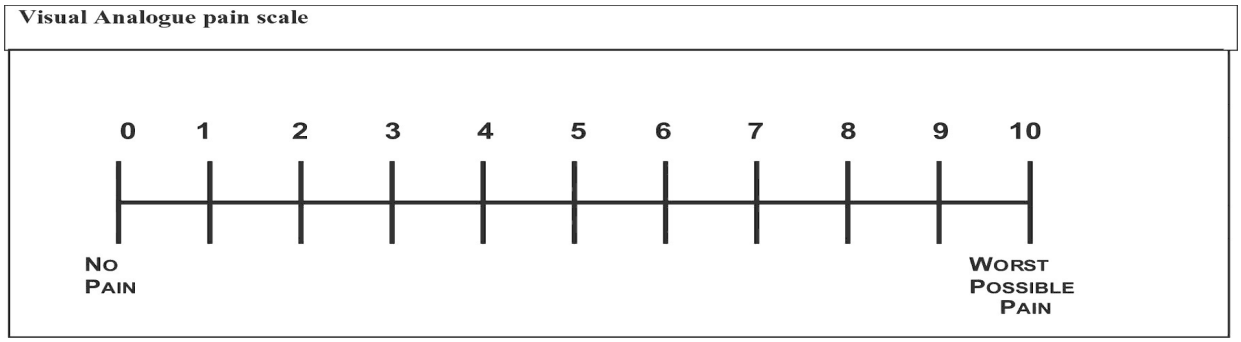
BEFORE ACU-TENS APPLICATION



30 MINUTES AFTER ACU-TENS APPLICATION



60 MINUTES AFTER ACU-TENS APPLICATION



Duration of labor:

Stage I:

Stage II:

Stage III:

Mode of delivery:

- Spontaneous normal delivery
- Instrumental delivery - Vacuum extraction / Forceps

  If instrument delivery, indication -
- LSCS – Emergency / Elective

  If LSCS, indication -

Liquor:

Clear ☐

Meconium ☐

Episiotomy: Yes / No If yes, sutured with_____.

Perineal tears (If any): I^{O} / II^{O} / III^{O}

Estimated blood loss:☐ ml.

PPH: Yes / No

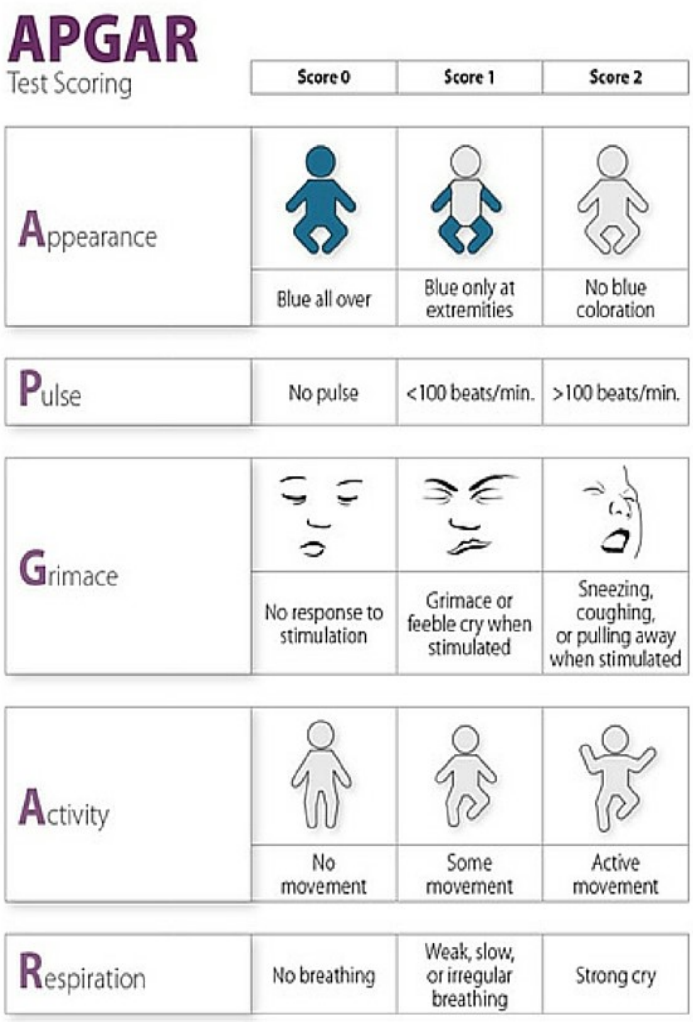
NEONATAL ASSESSMENT

Paediatrician name:

Date of birth: Time of birth:

Gender: ☐ Male ☐ Female Birth Weight:

APGAR SCORE



	1 MINUTE AFTER BIRTH	5 MINUTES AFTER BIRTH
TOTAL		

Resuscitation:

Intubation: Yes / No

NICU admission: Yes / No If yes, reason:

Neonatal Diagnosis:

SHORT SUMMARY OF THE CASE:

Date:

Place:

Signature of investigator Signature of the Consultant Doctor

APPENDIX 2

CONSENT FORM

I, Mrs._____ voluntarily agree to participate in the research study conducted entitled **"Effectiveness of Kinesiotaping and ACU-TENS on maternal and neonatal outcomes in the first stage of labor among Primigravidas,**" which is being conducted at Department of Obstetrics and Gynaecology, Sri Ramakrishna Hospital, Coimbatore.

I understand that the study involves measurement of my labour pain intensity, duration of labour and my baby's well being during labour and delivery through the completion of the intervention protocol.

I acknowledge that:

- I have received an adequate explanation of possible risks and inconveniences that may arise from participation in this study.
- I have received a copy and read fully the written information concerning the study, and any questions have been answered to my satisfaction.
- I understand that all the information I provide will be identified by code only.
- I understand that the information I provide will be kept on secured premises and will be available to the study investigator only except at my request or on my authorization.
- I understand that I am free to withdraw my consent at any time during the study and that the information which has been collected will not be used in this case.

PARTICULARS	NAME	SIGNATURE	DATE	TIME
PATIENT				
REPRESENTATIVE RELATIONSHIP				
INVESTIGATOR				

SELECTION CRITERIA

INCLUSION CRITERIA	YES	NO
Women during first stage of labor with regular painful, palpable uterine contractions, cervical dilatation between 3 & 5 cm		
Normal single fetus		
Cephalic presentation		
Anticipated normal delivery		
Normal fetal heart rate		
Minimum 2 uterine contractions at 10 minutes intervals		

EXCLUSION CRITERIA	YES	NO
Presence of Pre-eclampsia		
Placenta Previa		
Rupture of membrane		
Multiple pregnancies		
Cephalopelvic disproportion		
Fetal growth retardation		
Any systemic and mental disorders		
History of back surgery		
Evidence of previous vertebral fractures or major spinal structural abnormalities, Spondylolisthesis, & Spinal stenosis		
Presence of skin abnormalities		
Sensory disturbance		

APPENDIX 3

PERMISSION LETTERS

From
B. Shivaranjani,
First year MPT,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

To
The Dean,
Sri Ramakrishna Hospital,
Coimbatore -641044.

Through
The Principal,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

Respected sir,

Sub: Requisition to utilize the hospital facilities - MPT dissertation – reg;

I, B. Shivaranjani, first year MPT student of college of physiotherapy, SRIPMS, would like to inform your good self that I have to submit a dissertation based on my field of specialization as per the guidelines laid down by **The Tamil Nadu Dr.M.G.R.Medical University, Chennai.** Hence, I here with enclosed the proposal of the dissertation entitled, "**Effects of Breathing, Kinesio-taping and Acu-TENSon labour and delivery in primigravid Women,**" under the guidance of **Prof. M. SANGEETHA. M.P.T.,** (OBG), for your kind perusal. In this regard, I would be greatly obliged if you could grant me permission to utilize the hospital facilities to carry out my dissertation work.

Thank you

Yours sincerely,
B. Shivaranjani.

Date: 07/06/2018
Place: Coimbatore

M. Sangeetha 7/6/2018
Signature of the Guide

Barathi mani
Signature of the Principal
Prof. B. Sankarmani, MPT.,MBA
Principal
College of Physiotherapy
Sri Ramakrishna Institute of Paramedical Sciences
395, Sarojini Naidu Road, Siddhapudur
Coimbatore - 641 044.

To be permitted
7/6/18
To DR Banumathy HOD / OG.

Can Meet
21/6/18

DR. M. BANUMATHY. MBBS. DGO. DNB
REG. NO: 29866
OBSTETRICIAN & GYNAECOLOGIST

From

B. Shivaranjani,
MPT II year,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

To

Dr.R.Lalitha. M.B.B.S.,D.G.O,
Department of Obstetrics and Gynaecology,
Sri Ramakrishna Hospital,
Coimbatore -641044.

Through

The Principal,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

Respected sir,

Sub: Requisition to utilize the hospital facilities - MPT dissertation – reg;

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Thank you

Yours sincerely,
B. Shivaranjani.

Date: 28/6/18
Place: Coimbatore

M. Sangeetha
Signature of the Guide

Signature of the Principal

Prof. B. Sankarmani, MPT.,MBA
Principal
College of Physiotherapy
Sri Ramakrishna Institute of Paramedical Sciences
395, Sarojini Naidu Road, Siddhapudur
Coimbatore - 641 044.

Dr. R. LALITHA, M.B.B.S.,D.G.O.
CONSULTANT OBSTETRICIAN & GYNAECOLOGIST
Regd. No: 27572

Permitted

Dr. R. LALITHA

From

B. Shivaranjani,
MPT II year,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

To

Dr.M.S.Lakshmi. M.B.B.S.,DNB (OG),
Department of In vitro fertilization (IVF),
Sri Ramakrishna Hospital,
Coimbatore -641044.

Through

The Principal,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

Respected sir,

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Thank you

Yours sincerely,
B. Shivaranjani.

Date: 28/6/18
Place: Coimbatore

Signature of the Guide

I agree.

Dr. M.S. LAKSHMI
Regd. No. 55085

Signature of the Principal

Prof. B. Sankarmani, MPT.,MBA
Principal
College of Physiotherapy
Sri Ramakrishna Institute of Paramedical Sciences
395, Sarojini Naidu Road, Siddhapudur
Coimbatore - 641 044.

From

B. Shivaranjani,
MPT II year,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

To

Dr.R.Suganya Venkatesh. M.B.B.S., DNB (OG),
Department of IVF,
Sri Ramakrishna Hospital,
Coimbatore -641044.

Through

The Principal,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

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Thank you

Yours sincerely,
B. Shivaranjani.

Date: 28/6/18
Place: Coimbatore

Signature of the Guide

Signature of the Principal

Prof. B. Sankarmani, MPT.,MBA
Principal
College of Physiotherapy
Sri Ramakrishna Institute of Paramedical Sciences
395, Sarojini Naidu Road, Siddhapudur
Coimbatore - 641 044.

Dr. R. SUGANYA
Regd. No. 66442

From

B. Shivaranjani,
MPT II year,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

To

Dr.Kanmani. M.D.,DNB(OG).
Department of Obstetrics and Gynaecology,
Sri Ramakrishna Hospital,
Coimbatore -641044.

Through

The Principal,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

Respected sir,

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Thank you

Yours sincerely,
B. Shivaranjani.

Date: 28/6/18
Place: Coimbatore

Signature of the Guide

Signature of the Principal

Prof. B. Sankarmani, MPT.,MBA
Principal
College of Physiotherapy
Sri Ramakrishna Institute of Paramedical Sciences
395, Sarojini Naidu Road, Siddhapudur
Coimbatore - 641 044.

Dr. M. KANMANI M.D., DNB(OG)
Fellowship in Endogynaecology
Obstetrician and Gynaecologist
Reg. No: 75569

From

B. Shivaranjani,
MPT II year,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

To

Dr.Jasmine,
Department of Obstetrics and Gynaecology,
Sri Ramakrishna Hospital,
Coimbatore -641044.

Through

The Principal,
College of physiotherapy, SRIPMS,
Coimbatore -641044.

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Thank you

Yours sincerely,
B. Shivaranjani.

Date: 28/6/18
Place: Coimbatore

M. Sangeetha
Signature of the Guide

Permitted
Dr. JASMIN
Regd. No. 39046
Dr. Jasmin
M.B.B.S., D.N.B

Sankarmani
Signature of the Principal

Prof. B. Sankarmani, MPT.,MBA
Principal
College of Physiotherapy
Sri Ramakrishna Institute of Paramedical Sciences
395, Sarojini Naidu Road, Siddhapudur
Coimbatore - 641 044.

APPENDIX 4

TRAINING CERTIFICATE FOR ACUPRESSURE

VIRUKSHA'S ACADEMY & ACUPUNCTURE CENTER

Run By

ACU TOUCH MEDICAL ACADEMY

Recognised by

BSS (NATIONAL DEVELOPMENT AGENCY) GOVT OF INDIA

CERTIFICATE OF PARTICIPATION

This Certificate has been awarded to SHIVARANJANI. B

has completed the 5 DAYS BASIC Training programe

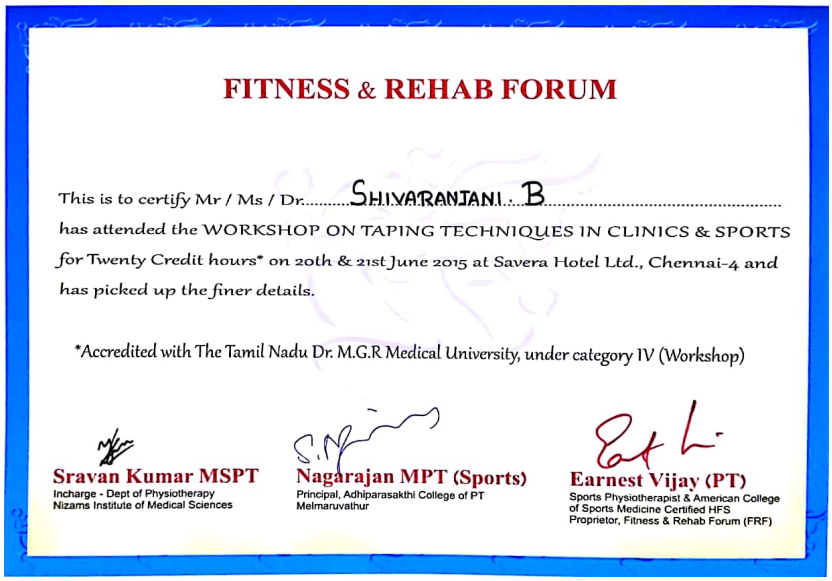
on ACUPRESSURE

Date: 10/12/18 Venue: COIMBATORE Regd. No: TN5103

Director

OFFICE: No.6 SND Layout, 4th Street, Tatabad, Coimbatore- 641012. Web:www.virukshas.com

TRAINING CERTIFICATE FOR KINESIOTAPING



FITNESS & REHAB FORUM

This is to certify Mr / Ms / Dr. SHIVARANJANI. B has attended the WORKSHOP ON TAPING TECHNIQUES IN CLINICS & SPORTS for Twenty Credit hours* on 20th & 21st June 2015 at Savera Hotel Ltd., Chennai-4 and has picked up the finer details.

*Accredited with The Tamil Nadu Dr. M.G.R Medical University, under category IV (Workshop)

Sravan Kumar MSPT
Incharge - Dept of Physiotherapy
Nizams Institute of Medical Sciences

Nagarajan MPT (Sports)
Principal, Adhiparasakthi College of PT
Melmaruvathur

Earnest Vijay (PT)
Sports Physiotherapist & American College of Sports Medicine Certified HFS
Proprietor, Fitness & Rehab Forum (FRF)